

MEASUREMENT REPORT

FCC PART 15.247 Bluetooth (Low Energy)

Applicant Name:

Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:

10/8/2021-10/25/2021

Test Site/Location:

PCTEST Lab. Morgan Hill, CA, USA

Test Report Serial No.:

1M2109090102-17.A3L

FCC ID:

A3LSMS908U

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SM-S908U

Additional Model(s):

SM-S908U1

EUT Type:

Portable Handset

Max. RF Output Power:

62.13mW (17.93dBm) Peak Conducted

Frequency Range:

2402 – 2480MHz

FCC Classification:

Digital Transmission System (DTS)

FCC Rule Part(s):

Part 15 Subpart C (15.247)

ISED Specification:

RSS-247 Issue 2

Test Procedure(s):

ANSI C63.10-2013, KDB 558074 D01 v05r02,
KDB 648474 D03 v01r04

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013 and KDB 558074 D01 v05r02. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.


Randy Ortanez
President

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility located at 18855 Adams Court, Morgan Hill, CA 95037. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST located in Morgan Hill, CA 95037, U.S.A.

- PCTEST is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISSED Standards (RSS).
- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISSED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS908U**. The data found in this test report was taken with the EUT operating in Bluetooth low energy mode. While in low energy mode, the Bluetooth transmitter hops pseudo-randomly between 40 channels, three of which are “advertising channels”. When the transmitter is hopping only between the three advertising channels, the EUT does not fall under the category of a “hopper” as defined in 15.247(a)(iii) which states that a “frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.” As operation on only the advertising channels does not qualify the EUT as a hopper, the EUT is certified as a DTS device in this mode. The data found in this report is representative of the device when it transmits on its advertising channels. Typical Bluetooth operation is covered under the DSS report found with this application.

Test Device Serial No: 0507M, 0579M, 0229M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1 and FR2), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer, Ultra Wideband

Ch.	Frequency (MHz)
0	2402
:	:
19	2440
:	:
39	2480

Table 2-1. Frequency / Channel Operations

Data Rate	Power Scheme	Antenna 1	Antenna 2	Dual
125kbps	ePA	✗	✗	✗
	iPA	✓	✓	✗
500kbps	ePA	✗	✗	✗
	iPA	✓	✓	✗
1Mbps	ePA	✓	✓	✗
	iPA	✓	✓	✓
2Mbps	ePA	✓	✓	✗
	iPA	✓	✓	✓

Table 2-2. Supported Data Rate and Power Scheme

✓ = Supported
✗ = Not Supported

Note: This device is capable of operating in hopping and non-hopping mode. The EUT can hop between 40 different channels in the 2400 – 2483.5MHz band.

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2.3 Antenna Description

Following antenna gains provided by manufacturer were used for the test.

Frequency [MHz]	Antenna 1 Gain (dBi)	Antenna 2 Gain (dBi)	Directional Gain (dBi)
2402	-6.82	-6.12	-3.45
2441	-7.77	-5.84	-3.74
2480	-7.11	-5.76	-3.40

Table 2-3. Highest Antenna Gain

2.4 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was also used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, and 7.8 for antenna port conducted emissions test setups.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with wireless charging pad (WCP) EP-N5105 while EUT operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.5 Software and Firmware

The test was conducted with firmware version S908USQU0AUJ9 installed on the EUT

2.6 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 v05r02 were used in the measurement of the EUT.

Deviation from measurement procedure.....None

3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 7m x 3.66m x 2.7m shielded enclosure. The shielded enclosure is manufactured by AP Americas. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-6. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is EPCOS 2X60A Power Line Filter (100dB Attenuation, 14kHz-18GHz) and the two EPCOs 2X48A filters (100dB Minimum Insertion Loss, 14kHz - 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.10. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 10.50.04.

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3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

Per KDB 414788, radiated emission test sites other than open-field test sites (e.g., shielded anechoic chambers), may be employed for emission measurements below 30MHz if characterized so that the measurements correspond to those obtained at an open-field test site. To determine test site equivalency, a reference sample transmitting at 149kHz was measured on an open field test site (asphalt with no ground plane) and then measured in the 3m semi-anechoic chamber. A calibrated 60cm loop antenna was rotated about its vertical axis

while the reference device was rotated through the X, Y and Z axis in order to capture the worst case level. A maximum deviation of 2.77dB at 149kHz was measured when comparing the 3 meter semi-anechoic chamber to the open field site.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33 depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

3.4 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antenna(s) of the EUT are **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The EUT complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.23-2012. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ($\pm$ dB)
Conducted Bench Top Measurements	1.65
Line Conducted Disturbance	2.75
Radiated Disturbance (<30MHz)	4.06
Radiated Disturbance (30MHz - 1GHz)	4.30
Radiated Disturbance (1 - 18GHz)	4.78
Radiated Disturbance (>18GHz)	4.79

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/31/2021	Annual	3/31/2022	MY49430244
ATM	180-442-KF	20dB Nominal Gain Horn Antenna (18-40GHz)	12/9/2020	Annual	12/9/2021	T058701-01
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	6/8/2021	Annual	6/8/2022	224569
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	5/3/2021	Annual	5/3/2022	205956
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	12/3/2020	Annual	12/3/2021	102327
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	12/3/2020	Annual	12/3/2021	101648
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	4/29/2021	Annual	4/29/2022	100051
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/16/2021	Annual	3/16/2022	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	6/11/2021	Annual	6/11/2022	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	11/9/2020	Annual	11/9/2021	101570
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/5/2021	Annual	4/5/2022	100519
Rohde & Schwarz	ENV216	Two-Line-V-Network (LISN)	12/7/2020	Annual	12/7/2021	101364

Table 6-1. Test Equipment List

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LSMS908U
FCC Classification: Digital Transmission System (DTS)
Number of Channels: 40

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	RSS-247 [5.2]	6dB Bandwidth	> 500kHz	CONDUCTED	PASS	Section 7.2
15.247(b)(3)	RSS-247 [5.4(d)]	Transmitter Output Power	< 1 Watt		PASS	Sections 7.3
15.247(e)	RSS-247 [5.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz Band		PASS	Section 7.4
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	≥ 20dBc		PASS	Sections 7.5, 7.6
15.205 15.209	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])	RADIATED	PASS	Sections 7.7, 7.8, 7.9
15.207	RSS-Gen [8.8]	AC Line Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen[8.8])	AC LINE CONDUCTED	PASS	Section 7.10

Table 7-1. Summary of Test Results

Notes:

- All modes of operation were investigated. The test results shown in the following sections represent the worst case emissions.
- The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
- For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Bluetooth LE Automation," Version 3.6.
- For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Chamber Automation," Version 1.3.2.

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7.2 6dB Bandwidth Measurement – Bluetooth (LE)

§15.247(a.2); RSS-247 [5.2]

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the transmitter antenna terminal of the EUT while the EUT is operating at maximum power and at the appropriate frequencies. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible 6dB bandwidth is 500 kHz.

Test Procedure Used

ANSI C63.10-2013 – Section 11.8.2 Option 2
KDB 558074 D01 v05r02 – Section 8.2

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability of the spectrum analyzer was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to $X = 6$. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 100kHz
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

All supported modulations and power schemes have been tested on the unit and only the worst case configuration is reported.

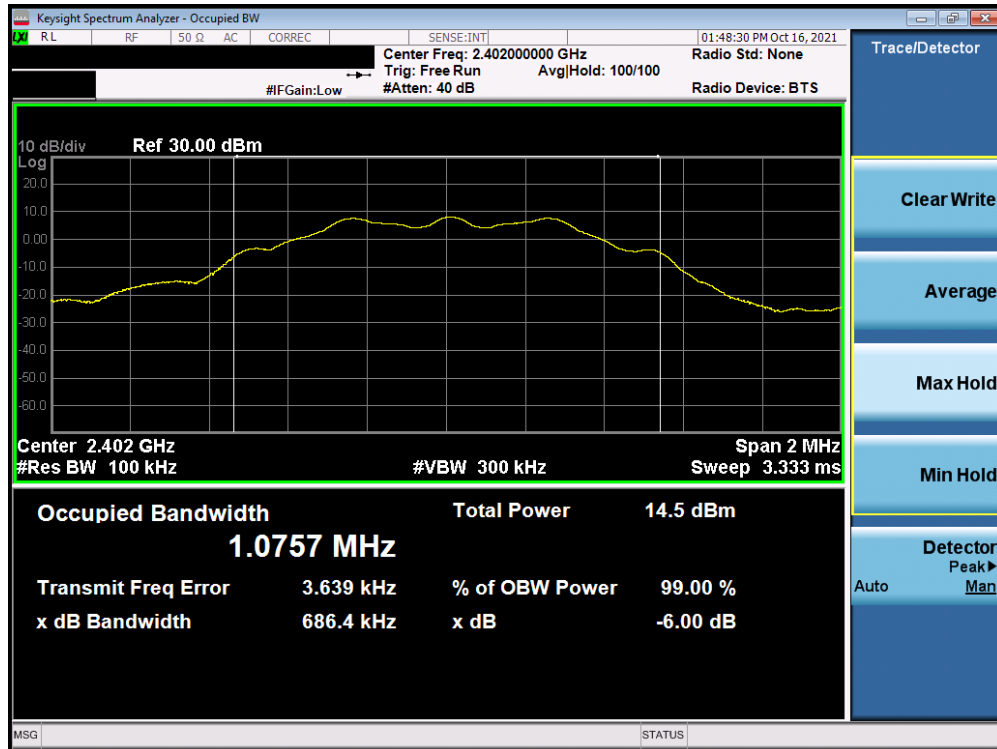
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Antenna 1

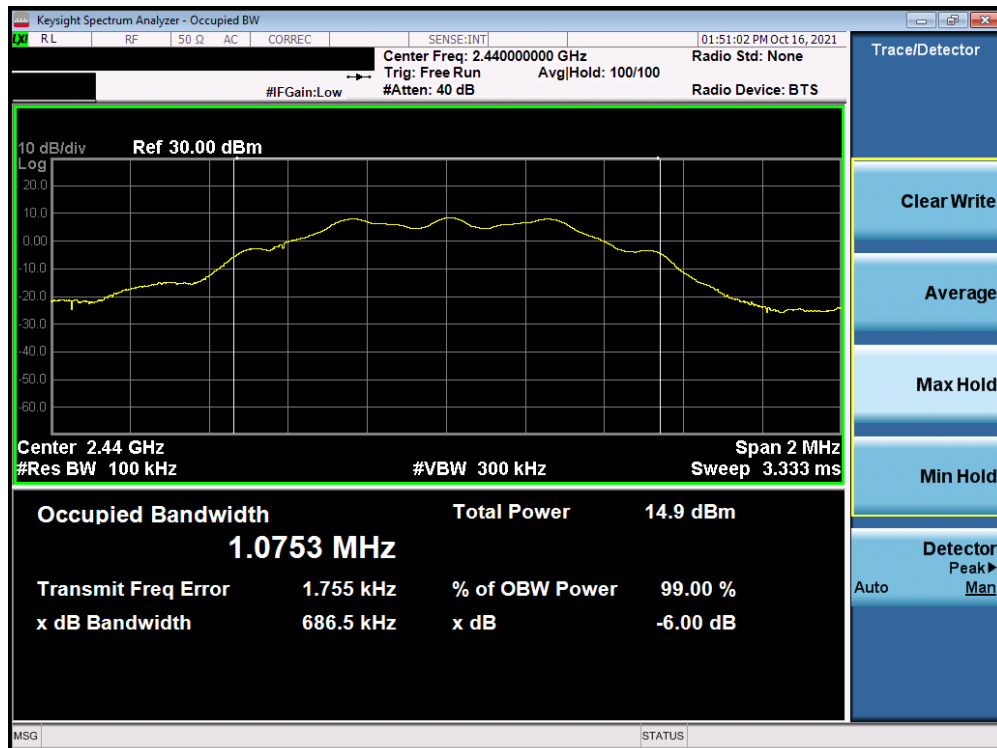
Frequency [MHz]	Data Rate	Modulation	Power Scheme	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	125 kbps	GFSK	iPA	0	LE	686.4	500	Pass
2440	125 kbps	GFSK	iPA	19	LE	686.5	500	Pass
2480	125 kbps	GFSK	iPA	39	LE	686.8	500	Pass
2402	500 kbps	GFSK	iPA	0	LE	664.7	500	Pass
2440	500 kbps	GFSK	iPA	19	LE	664.9	500	Pass
2480	500 kbps	GFSK	iPA	39	LE	660.0	500	Pass
2402	1 Mbps	GFSK	ePA	0	LE	721.1	500	Pass
2440	1 Mbps	GFSK	ePA	19	LE	721.9	500	Pass
2480	1 Mbps	GFSK	ePA	39	LE	724.4	500	Pass
2402	2 Mbps	GFSK	ePA	0	LE	1235.0	500	Pass
2440	2 Mbps	GFSK	ePA	19	LE	1239.0	500	Pass
2480	2 Mbps	GFSK	ePA	39	LE	1240.0	500	Pass

Table 7-2. Conducted Bandwidth Measurements Antenna 1

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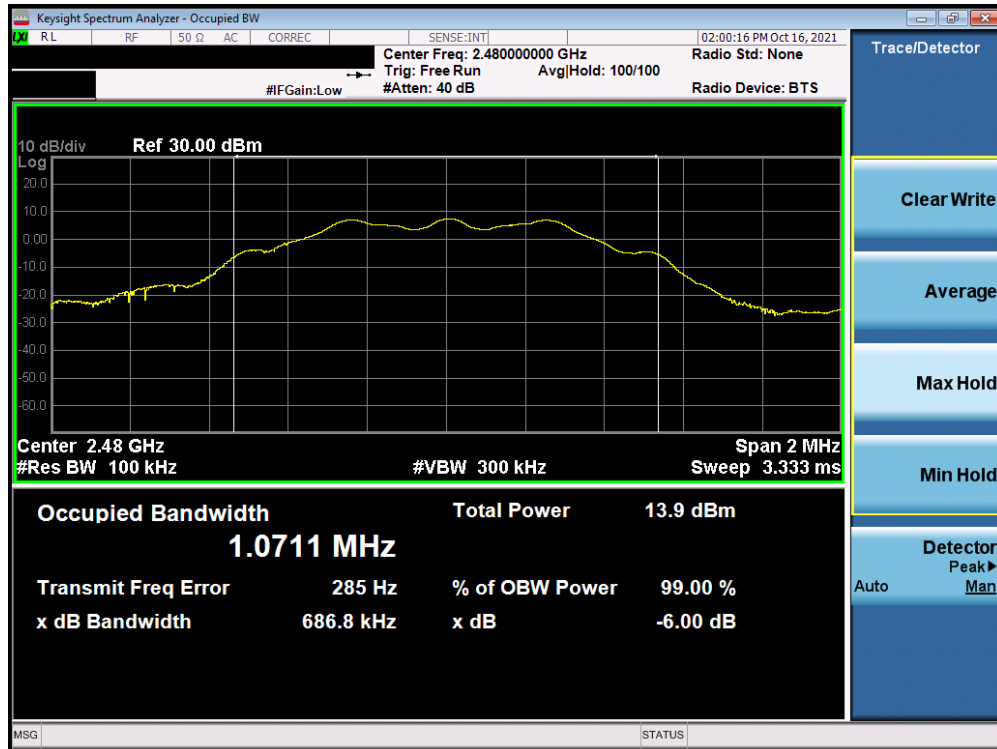


Plot 7-1. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps, iPA – Ch. 0) Antenna 1

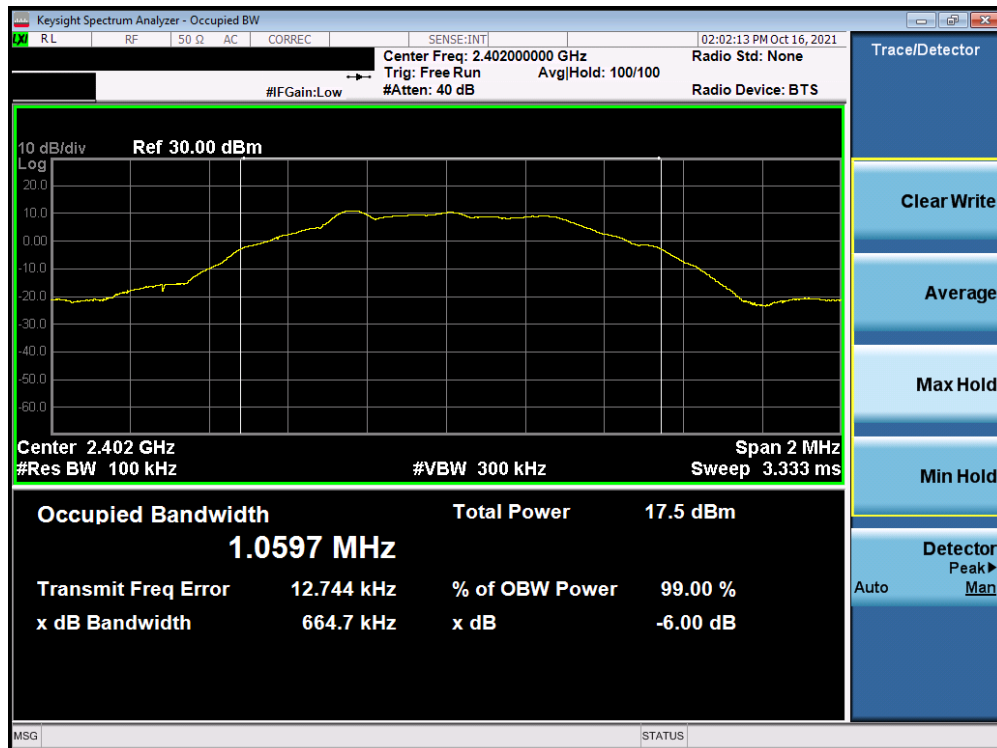


Plot 7-2. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps, iPA – Ch. 19) Antenna 1

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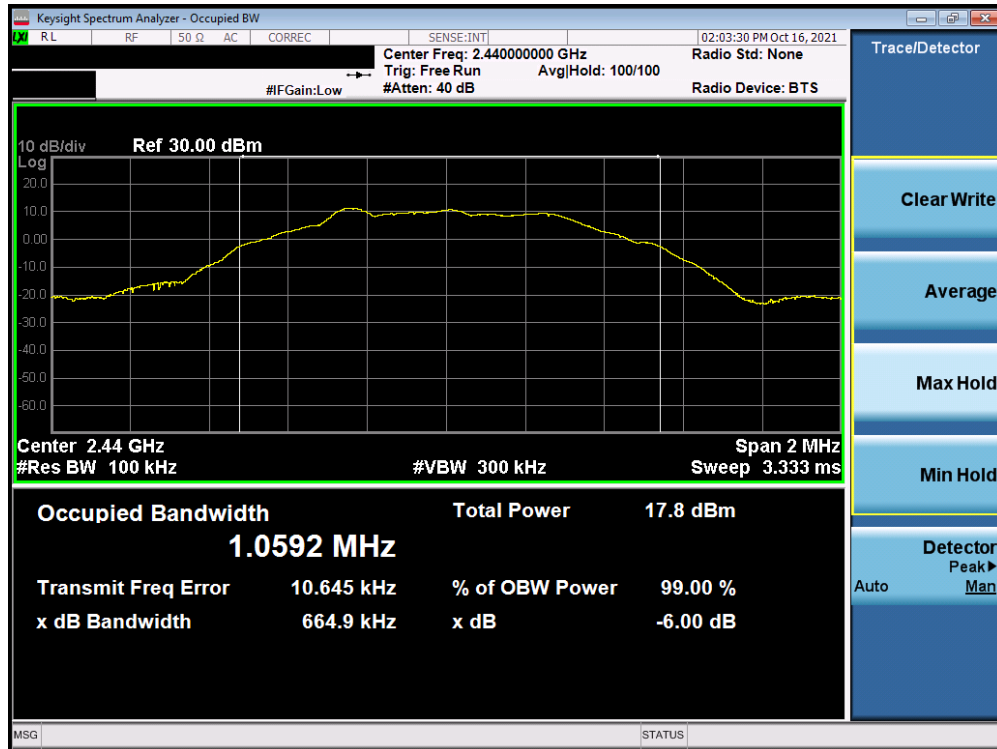


Plot 7-3. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps, iPA – Ch. 39) Antenna 1

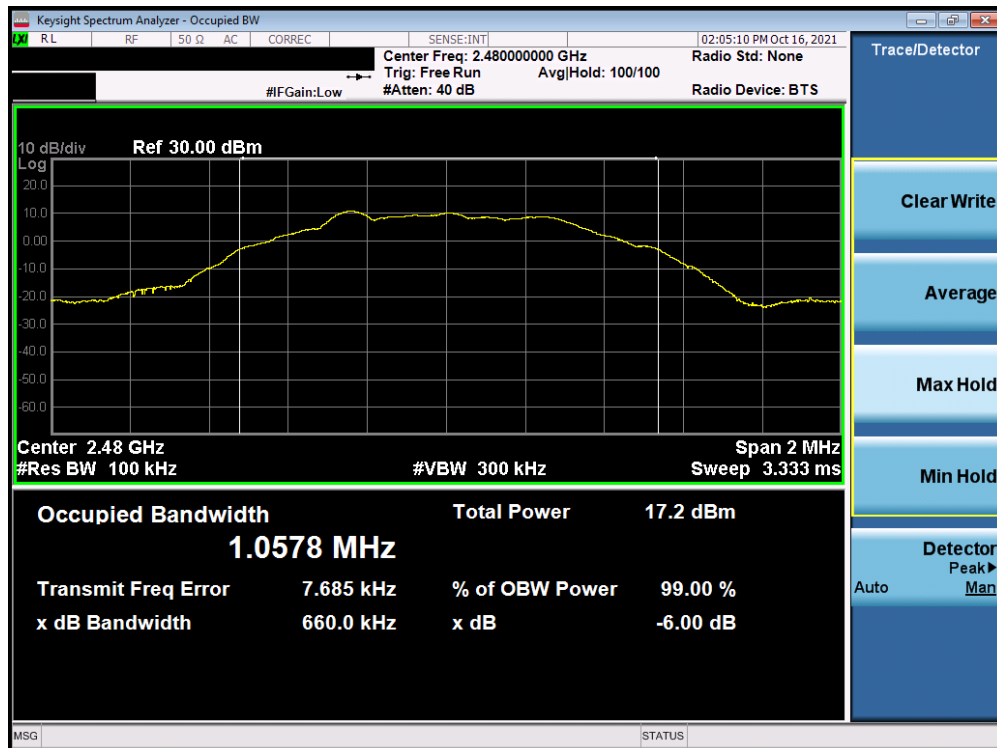


Plot 7-4. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps, iPA – Ch. 0) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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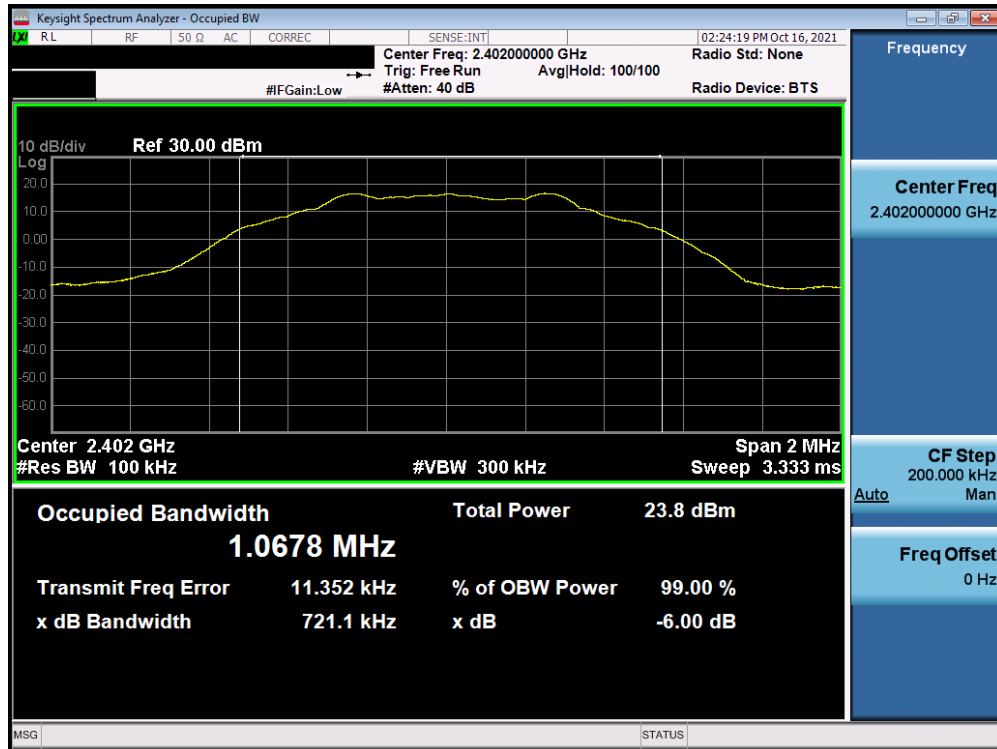


Plot 7-5. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps, iPA – Ch. 19) Antenna 1

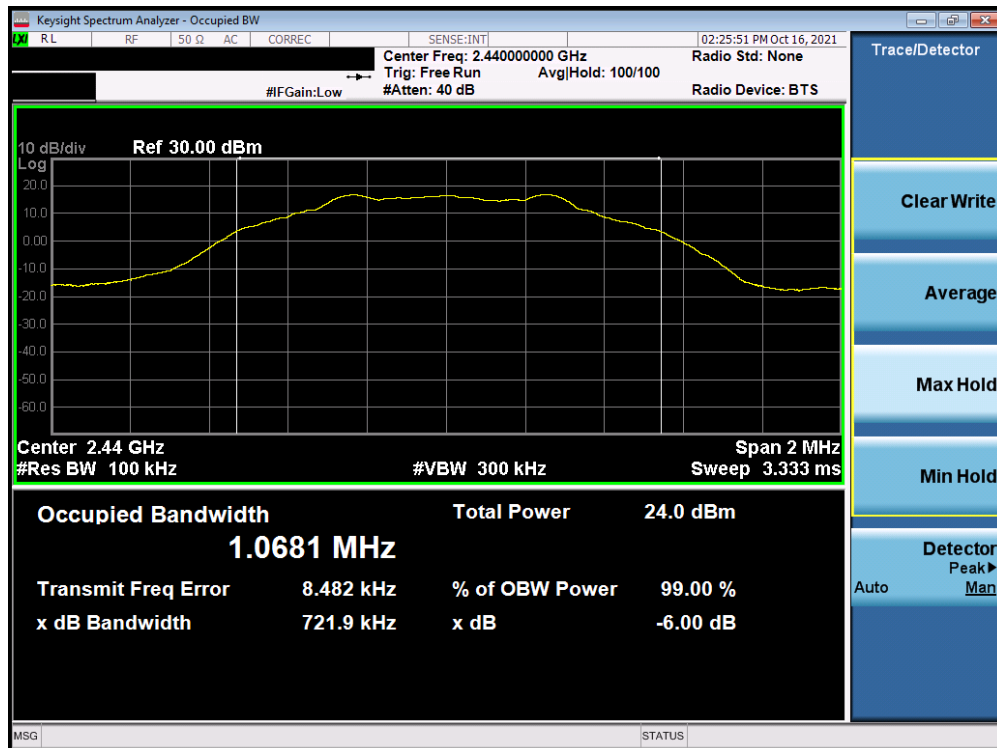


Plot 7-6. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps, iPA – Ch. 39) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 16 of 128

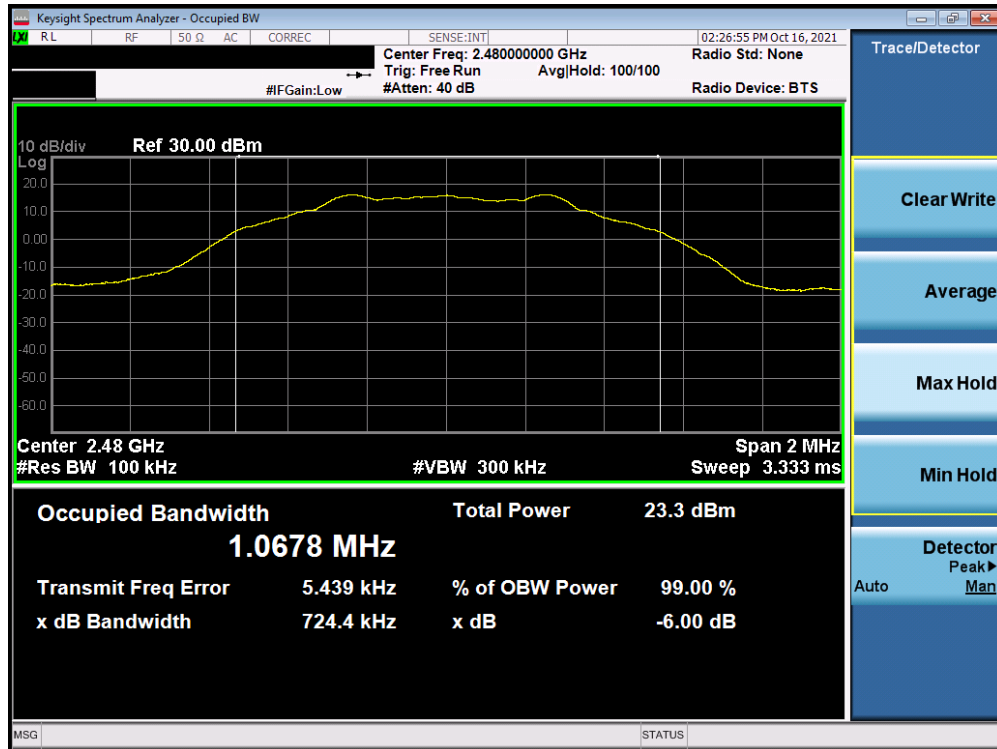


Plot 7-7. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 0) Antenna 1

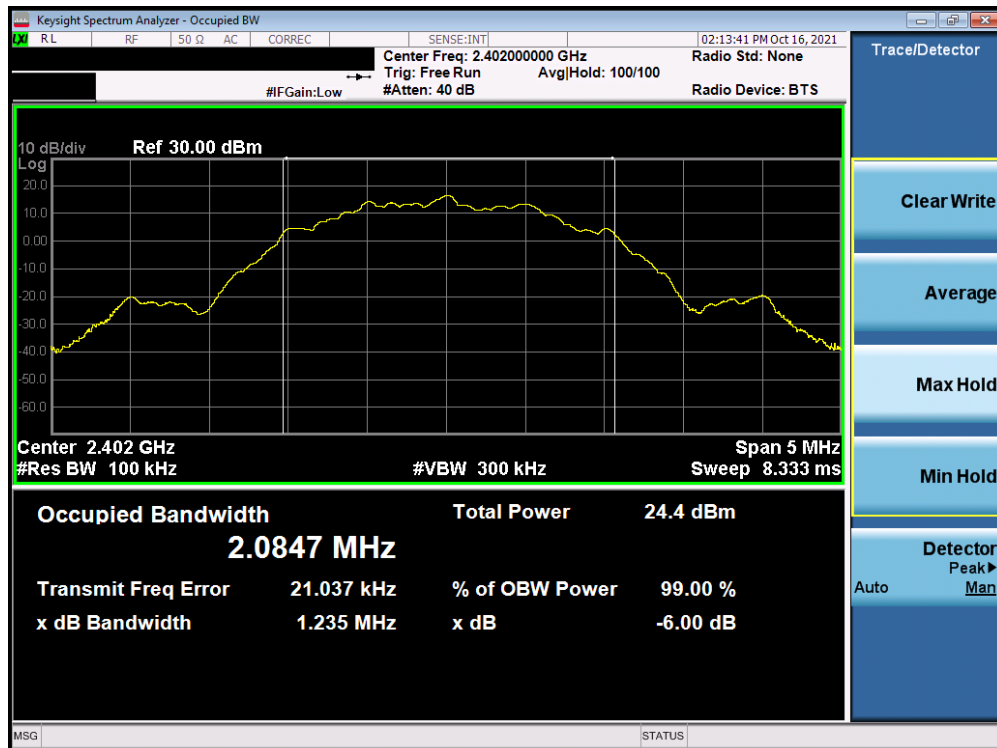


Plot 7-8. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 19) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 17 of 128

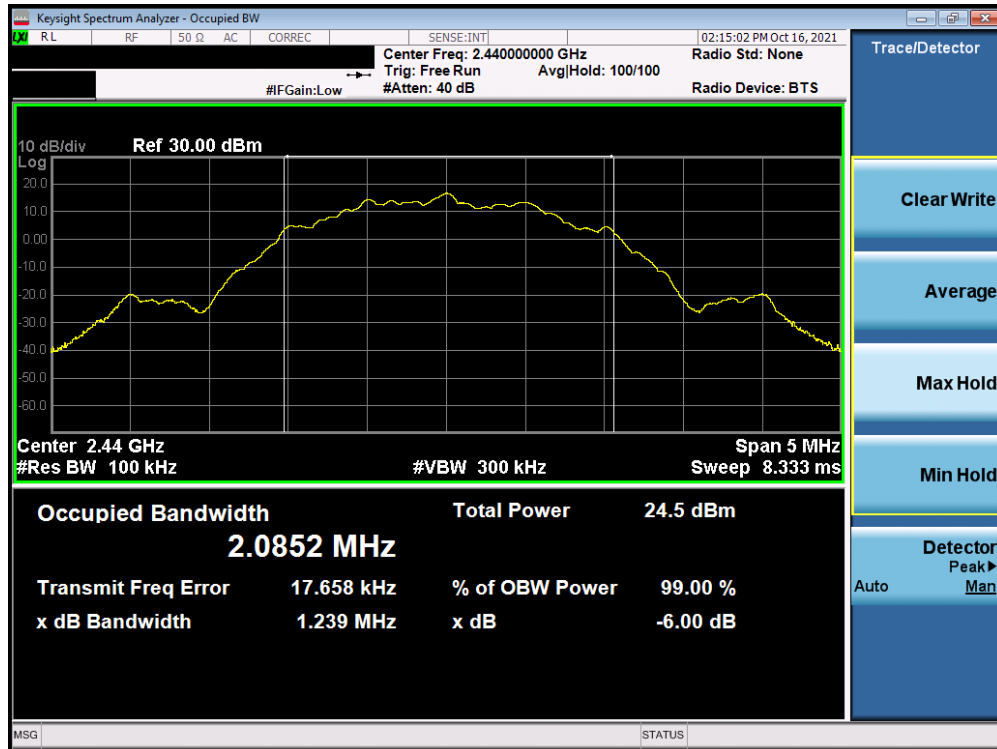


Plot 7-9. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 39) Antenna 1

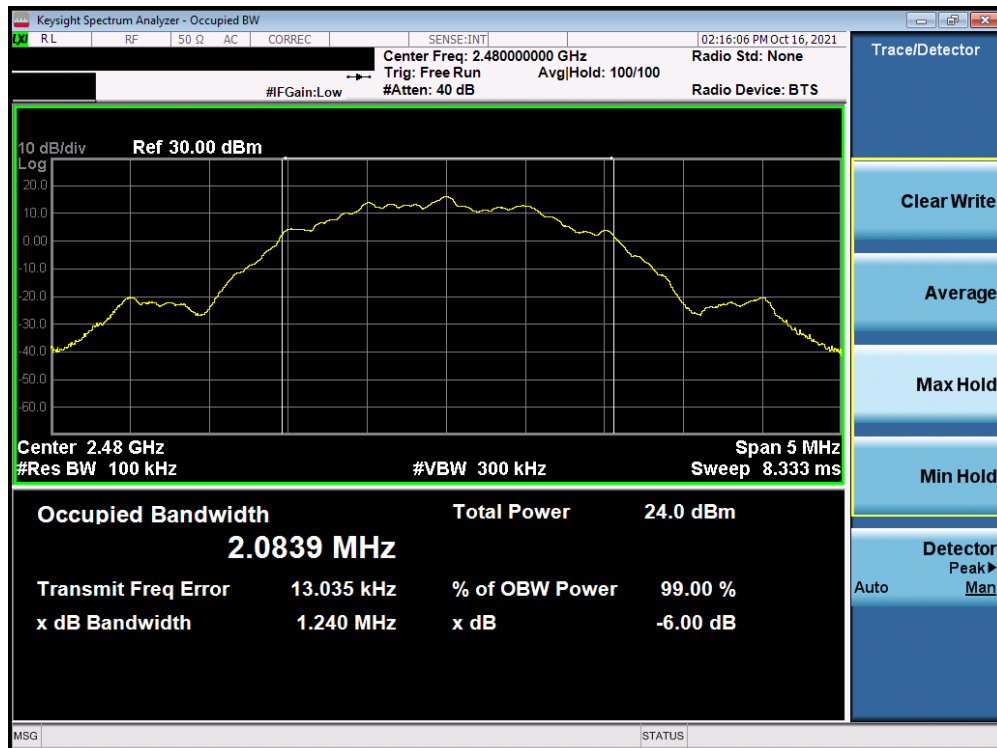


Plot 7-10. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 0) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 18 of 128



Plot 7-11. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 19) Antenna 1



Plot 7-12. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 39) Antenna 1

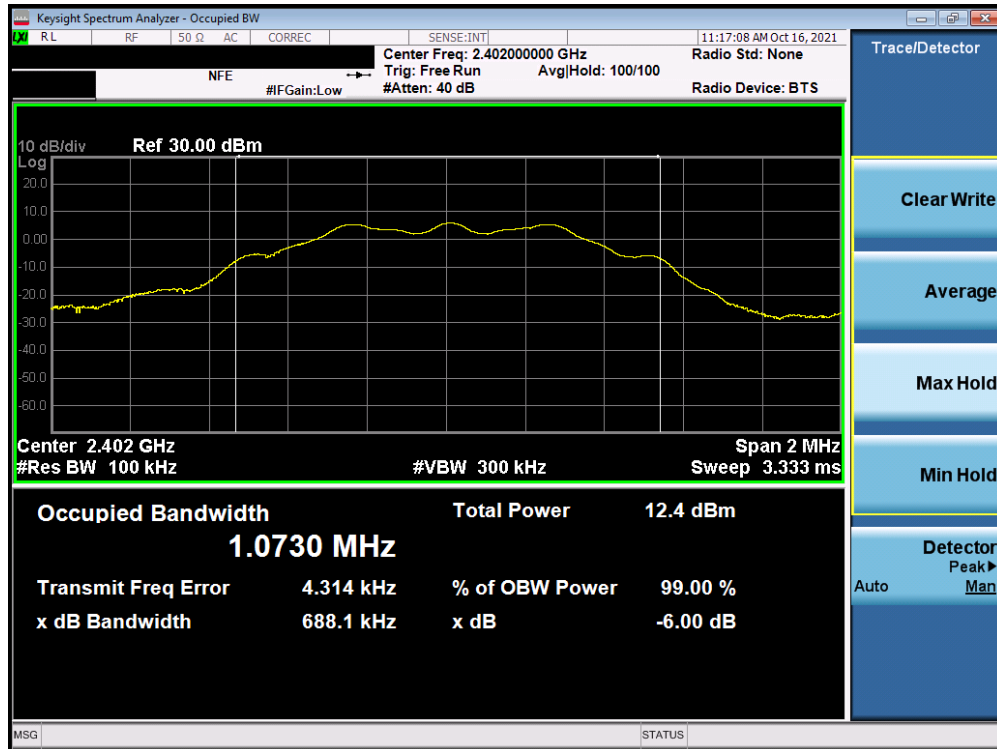
FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 19 of 128

Antenna 2

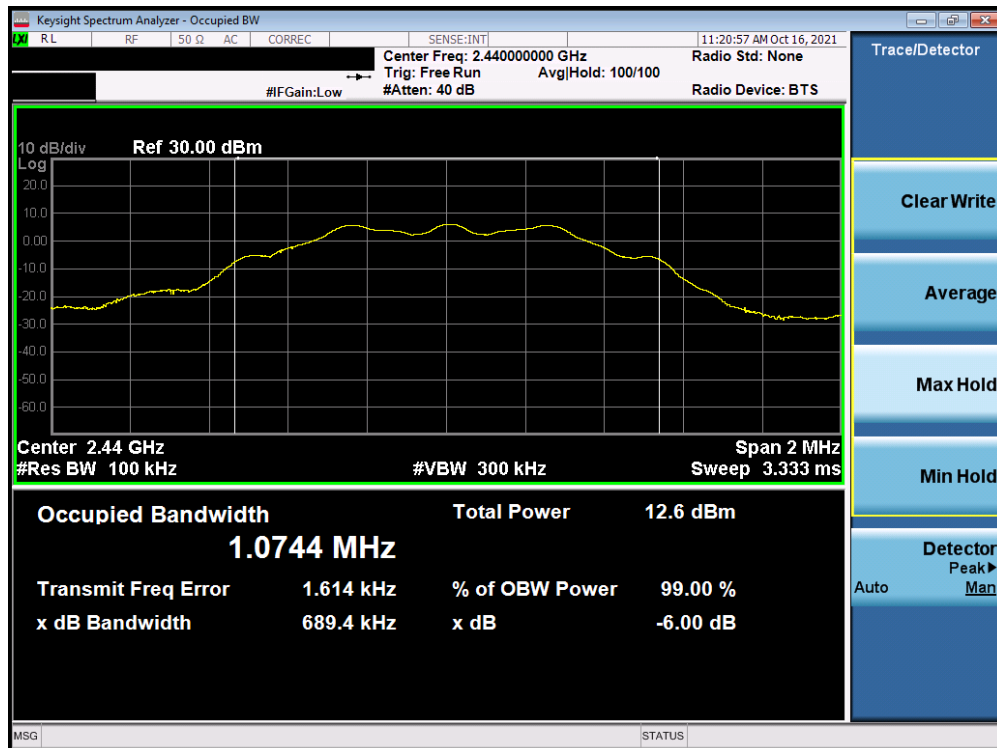
Frequency [MHz]	Data Rate	Mod.	Power Scheme	Channel No.	Bluetooth Mode	Measured Bandwidth [kHz]	Minimum Bandwidth [kHz]	Pass / Fail
2402	125 kbps	GFSK	iPA	0	LE	688.1	500	Pass
2440	125 kbps	GFSK	iPA	19	LE	689.4	500	Pass
2480	125 kbps	GFSK	iPA	39	LE	687.8	500	Pass
2402	500 kbps	GFSK	iPA	0	LE	664.1	500	Pass
2440	500 kbps	GFSK	iPA	19	LE	663.0	500	Pass
2480	500 kbps	GFSK	iPA	39	LE	661.8	500	Pass
2402	1 Mbps	GFSK	ePA	0	LE	722.7	500	Pass
2440	1 Mbps	GFSK	ePA	19	LE	722.7	500	Pass
2480	1 Mbps	GFSK	ePA	39	LE	721.5	500	Pass
2402	2 Mbps	GFSK	ePA	0	LE	1177.0	500	Pass
2440	2 Mbps	GFSK	ePA	19	LE	1238.0	500	Pass
2480	2 Mbps	GFSK	ePA	39	LE	1234.0	500	Pass

Table 7-3. Conducted Bandwidth Measurements Antenna 2

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 20 of 128

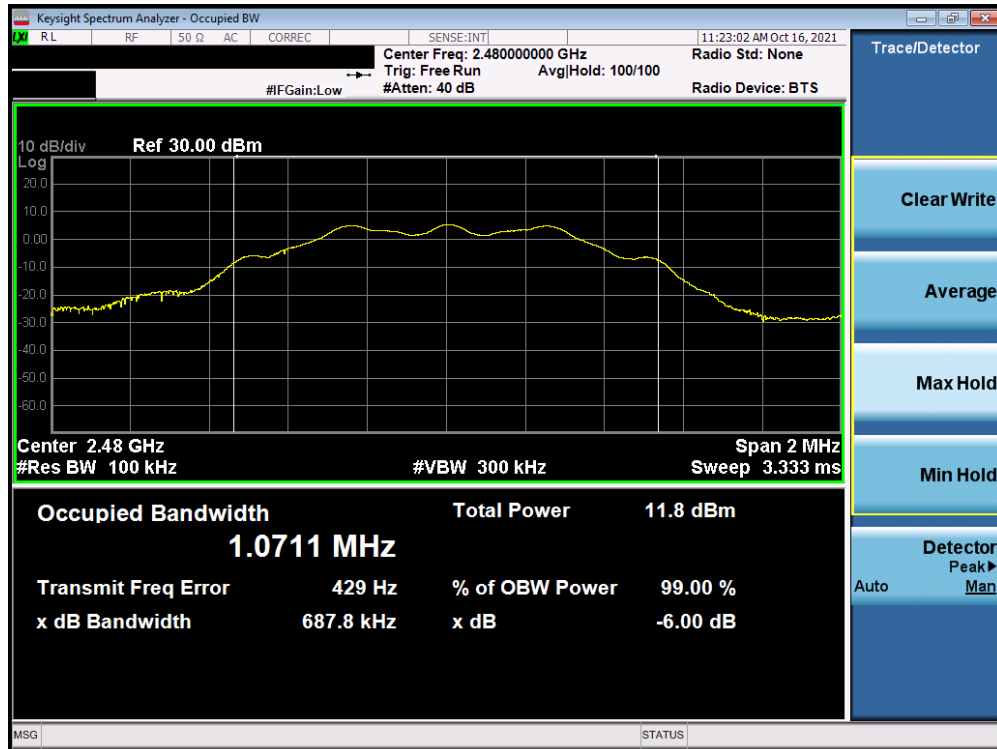


Plot 7-13. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps, iPA – Ch. 0) Antenna 2

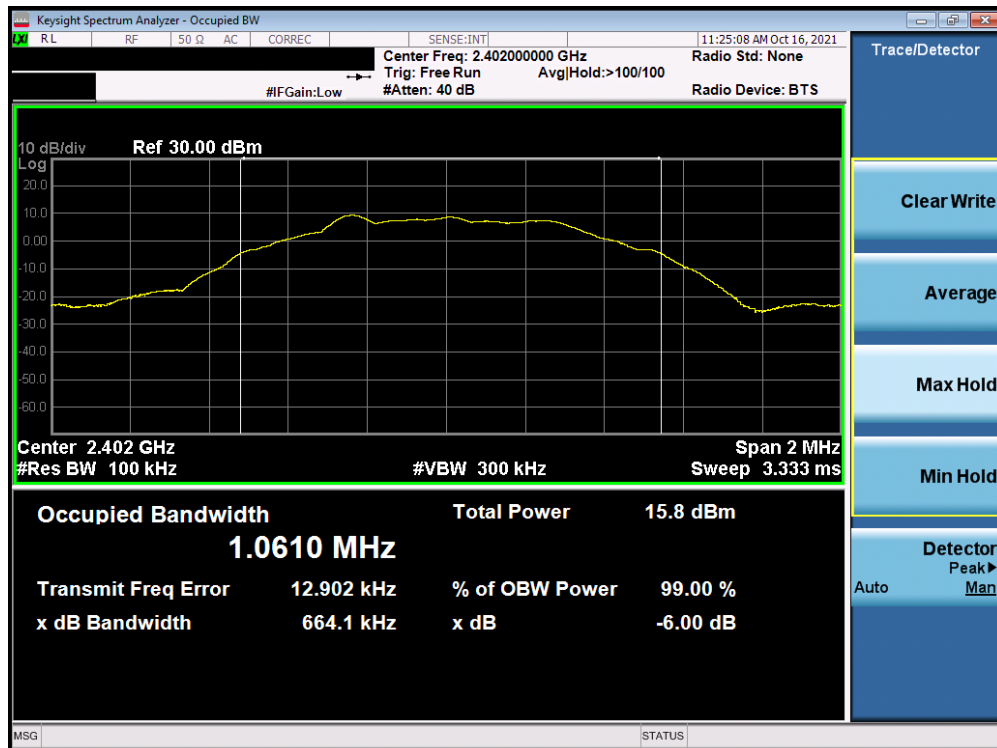


Plot 7-14. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps, iPA – Ch. 19) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 21 of 128

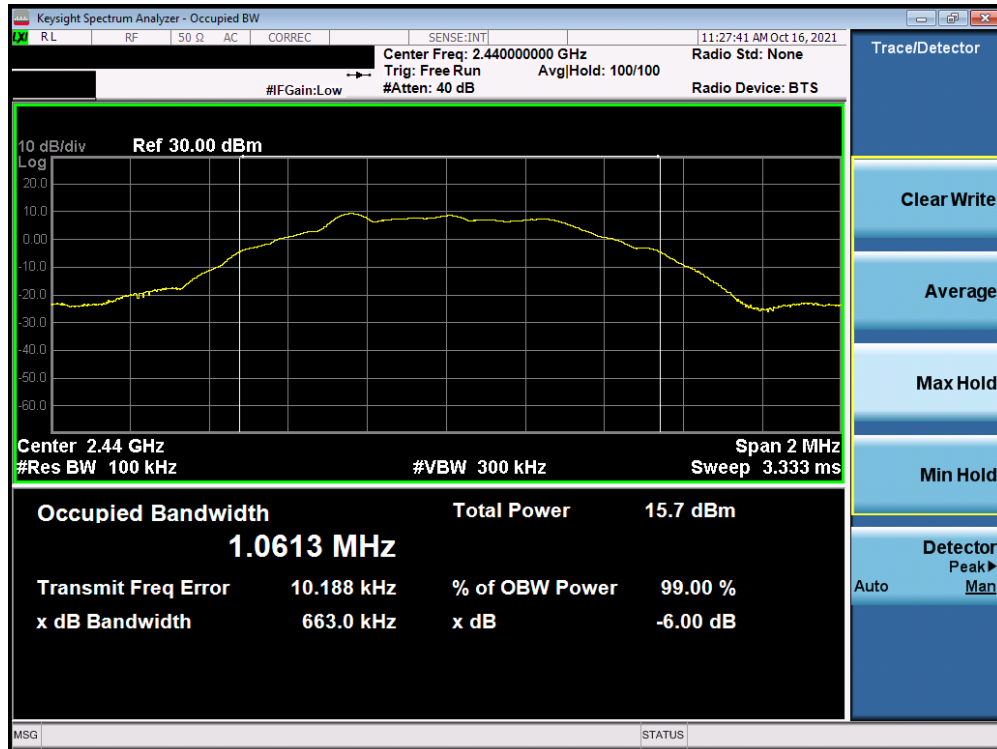


Plot 7-15. 6dB Bandwidth Plot (Bluetooth (LE), 125kbps, iPA – Ch. 39) Antenna 2

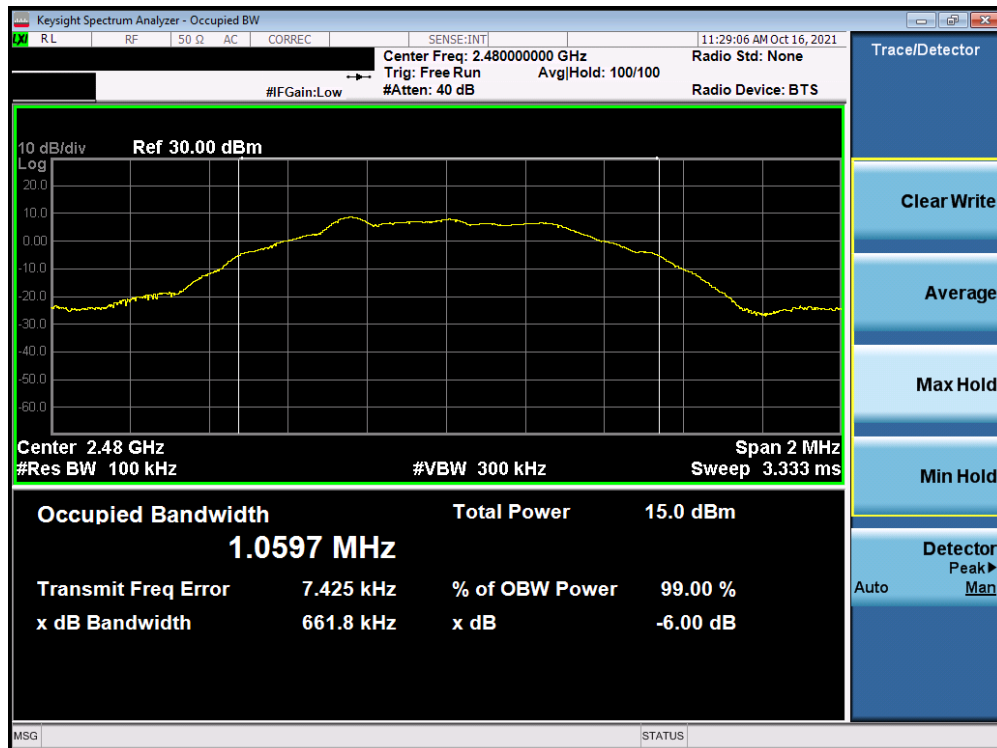


Plot 7-16. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps, iPA – Ch. 0) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 22 of 128

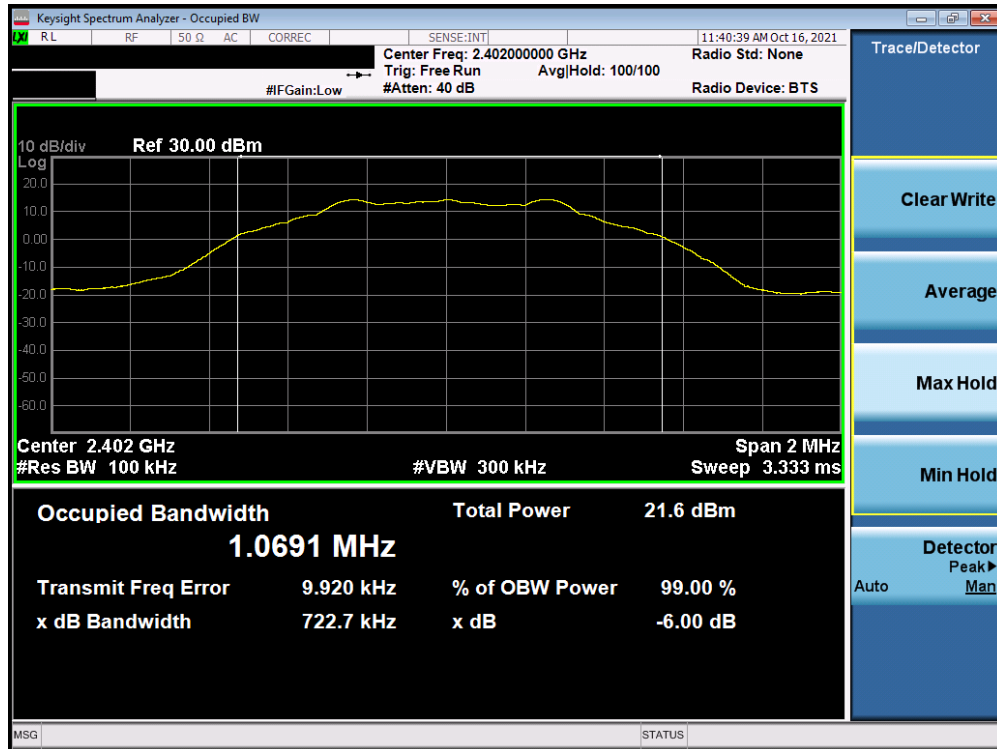


Plot 7-17. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps, iPA – Ch. 19) Antenna 2

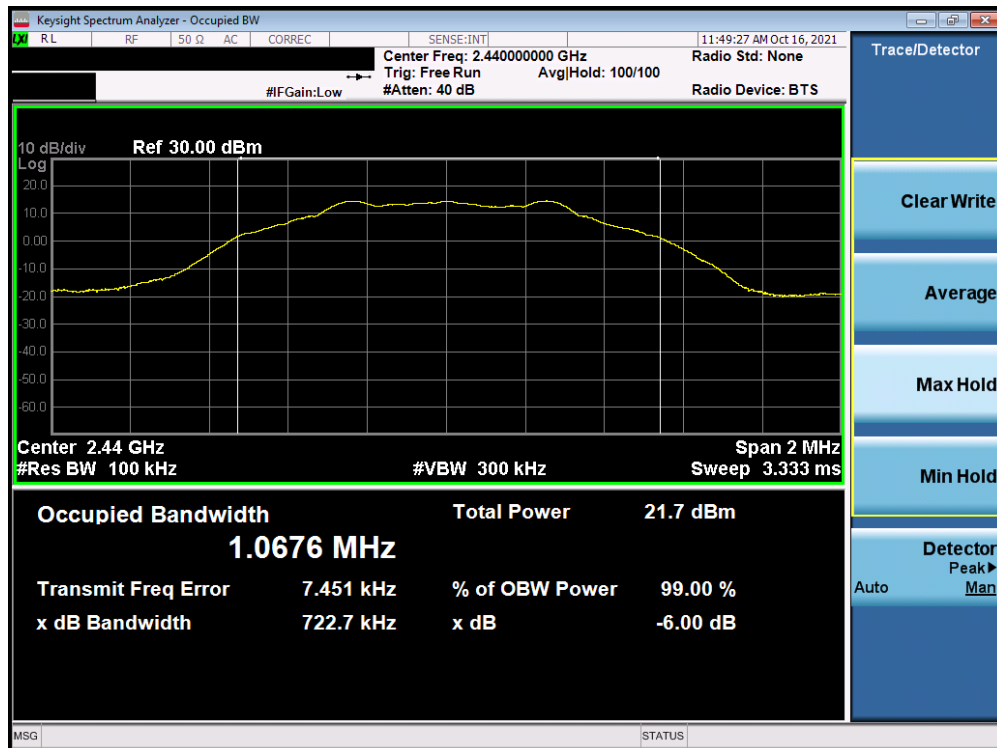


Plot 7-18. 6dB Bandwidth Plot (Bluetooth (LE), 500kbps, iPA – Ch. 39) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 23 of 128

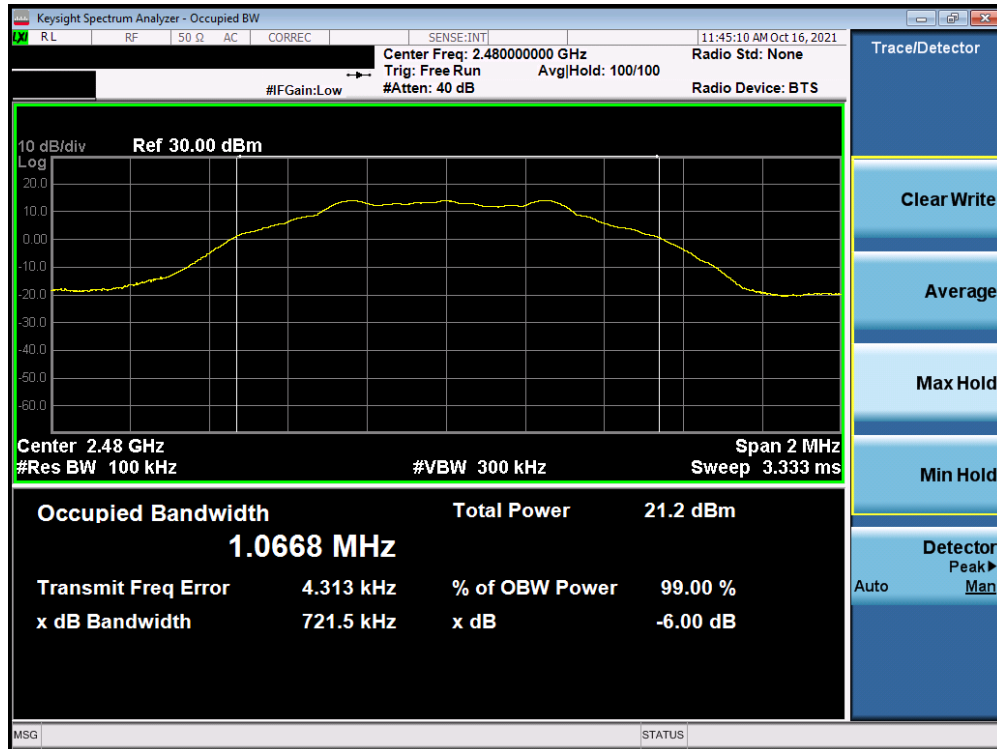


Plot 7-19. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 0) Antenna 2

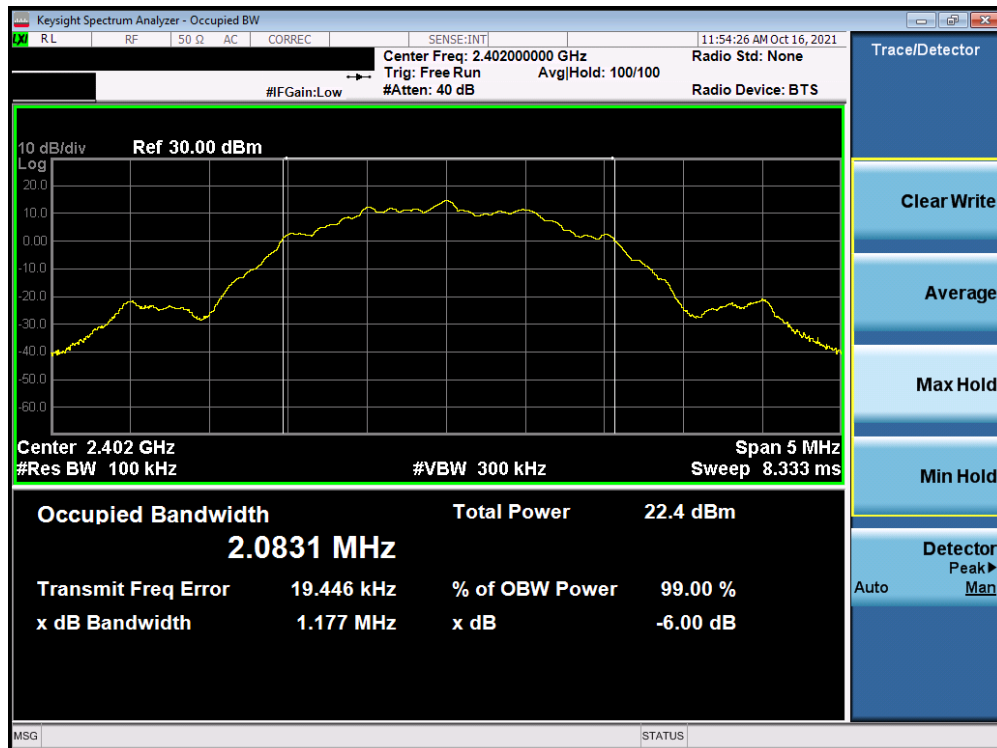


Plot 7-20. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 19) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 24 of 128

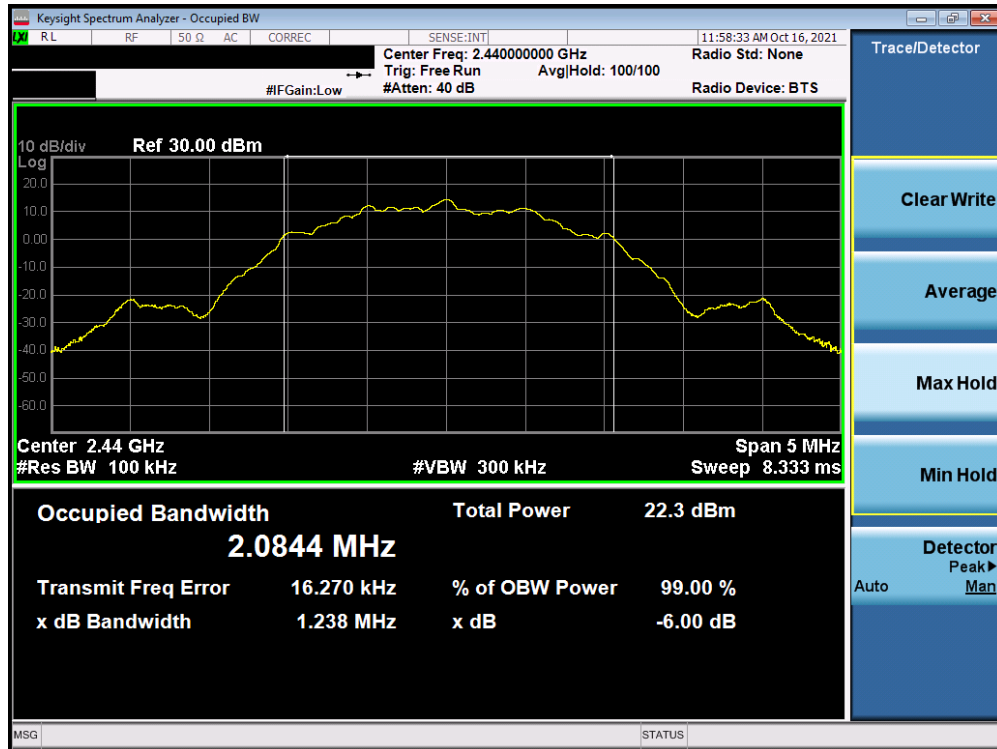


Plot 7-21. 6dB Bandwidth Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 39) Antenna 2

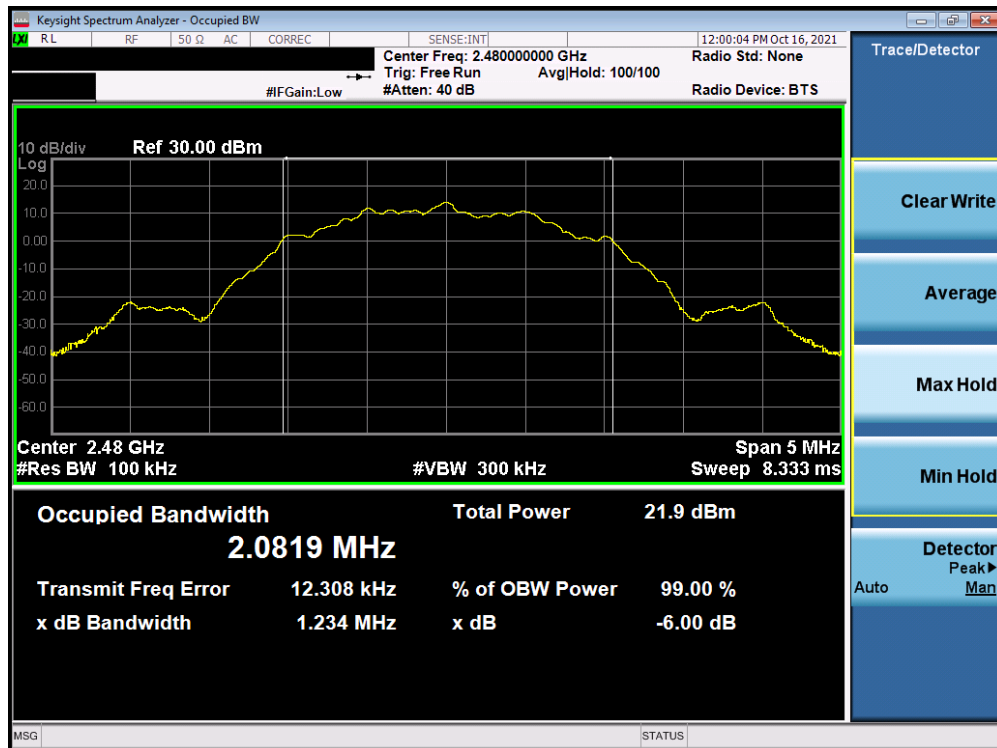


Plot 7-22. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 0) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 25 of 128



Plot 7-23. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 19) Antenna 2



Plot 7-24. 6dB Bandwidth Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 39) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 26 of 128

7.3 Output Power Measurement – Bluetooth (LE)

§15.247(b.3); RSS-247 [5.4(d)]

Test Overview and Limits

The transmitter antenna terminal of the EUT is connected to the input of a spectrum analyzer. Measurements are made while the EUT is operating at maximum power and at the appropriate frequencies.

The maximum peak conducted output power of digital modulation systems operating in the 2400-2483.5 MHz band is 1 Watt.

The conducted output power limit on paragraph above is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test Procedure Used

ANSI C63.10-2013 – Section 11.9.1.1

KDB 558074 D01 v05r02 – Section 8.3.1.1

ANSI C63.10-2013 – Section 14.2 Measure-and-Sum Technique

KDB 662911 D01 v02r01 – Section E)1) Measure-and-Sum Technique

Test Settings

1. Span $\geq 3 \times \text{RBW}$
2. RBW = 3MHz
3. VBW = 50MHz
4. Sweep = auto couple
5. Detector = peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-2. Test Instrument & Measurement Setup for Peak and Average Power Measurement

Test Notes

None

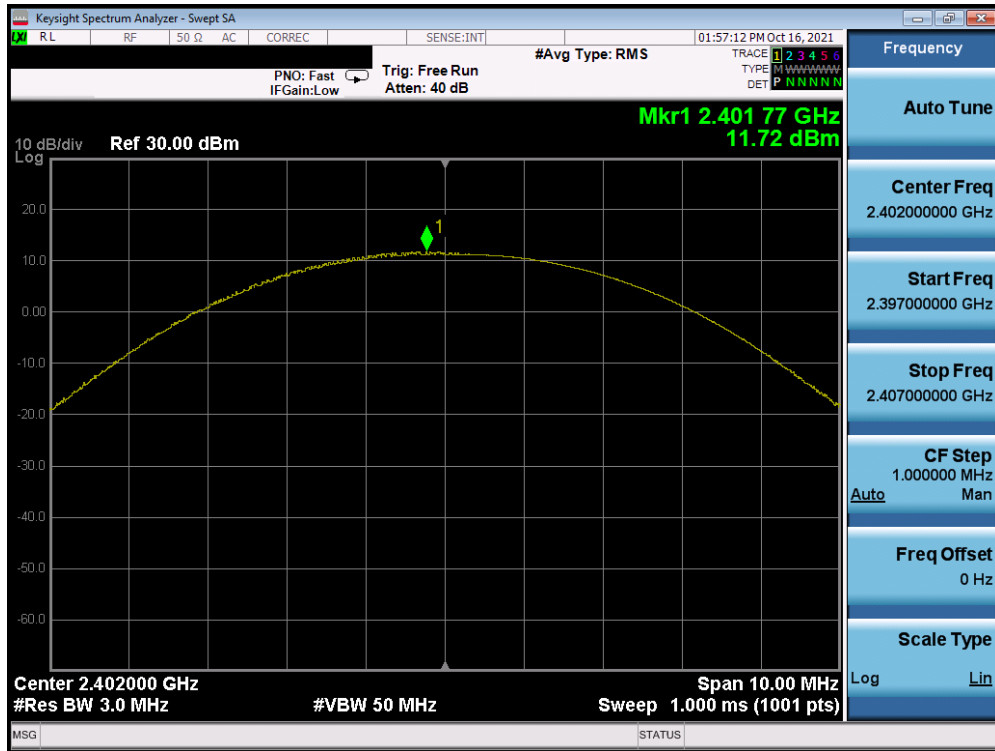
FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 27 of 128

Antenna 1

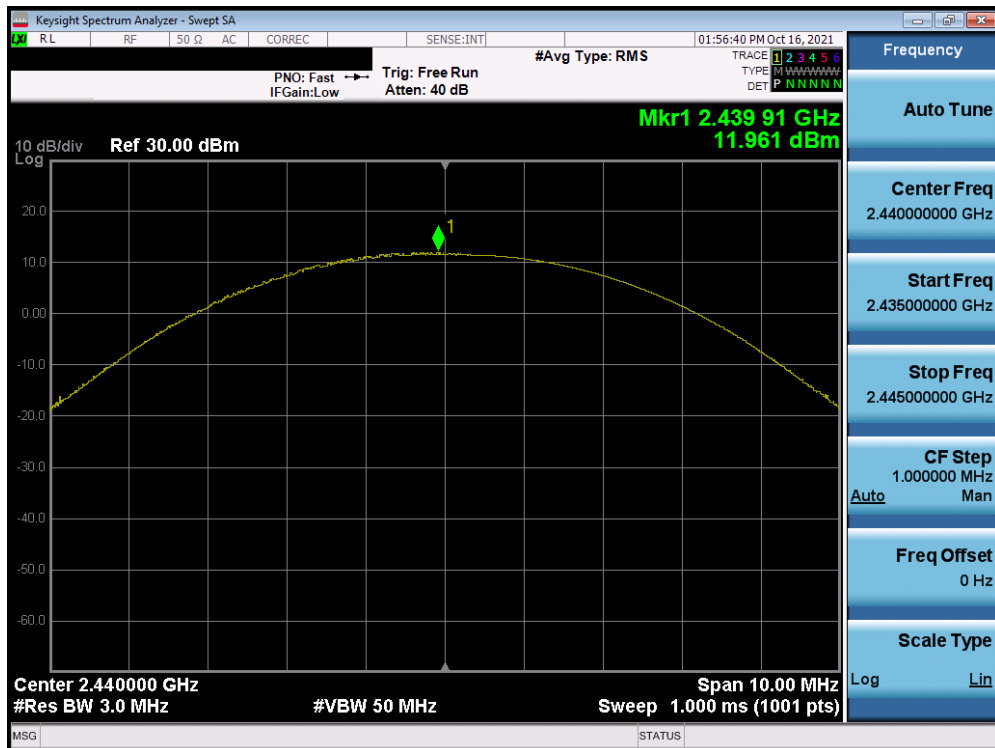
Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Bluetooth Mode	Peak Conducted Power	
					[dBm]	[mW]
2402	125 kbps	iPA	0	LE	11.72	14.859
2440	125 kbps	iPA	19	LE	11.96	15.707
2480	125 kbps	iPA	39	LE	11.13	12.984
2402	500 kbps	iPA	0	LE	11.74	14.921
2440	500 kbps	iPA	19	LE	11.95	15.671
2480	500 kbps	iPA	39	LE	11.16	13.062
2402	1 Mbps	ePA	0	LE	17.68	58.573
2440	1 Mbps	ePA	19	LE	17.85	60.912
2480	1 Mbps	ePA	39	LE	17.17	52.083
2402	1 Mbps	iPA	0	LE	11.89	15.467
2440	1 Mbps	iPA	19	LE	11.91	15.506
2480	1 Mbps	iPA	39	LE	11.23	13.274
2402	2 Mbps	ePA	0	LE	17.87	61.179
2440	2 Mbps	ePA	19	LE	17.93	62.130
2480	2 Mbps	ePA	39	LE	17.46	55.744
2402	2 Mbps	iPA	0	LE	11.77	15.018
2440	2 Mbps	iPA	19	LE	11.99	15.820
2480	2 Mbps	iPA	39	LE	11.24	13.295

Table 7-4. Conducted Output Power Measurements (Bluetooth LE) Antenna 1

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 28 of 128

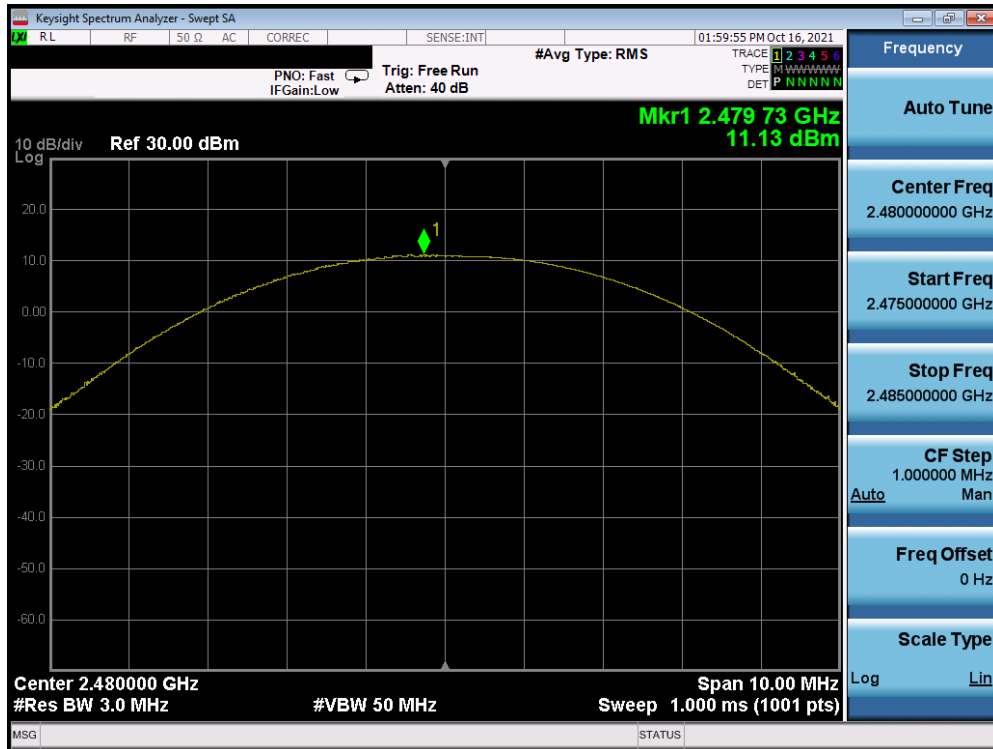


Plot 7-25. Peak Power Plot (Bluetooth (LE), 125kbps, iPA – Ch. 0) Antenna 1

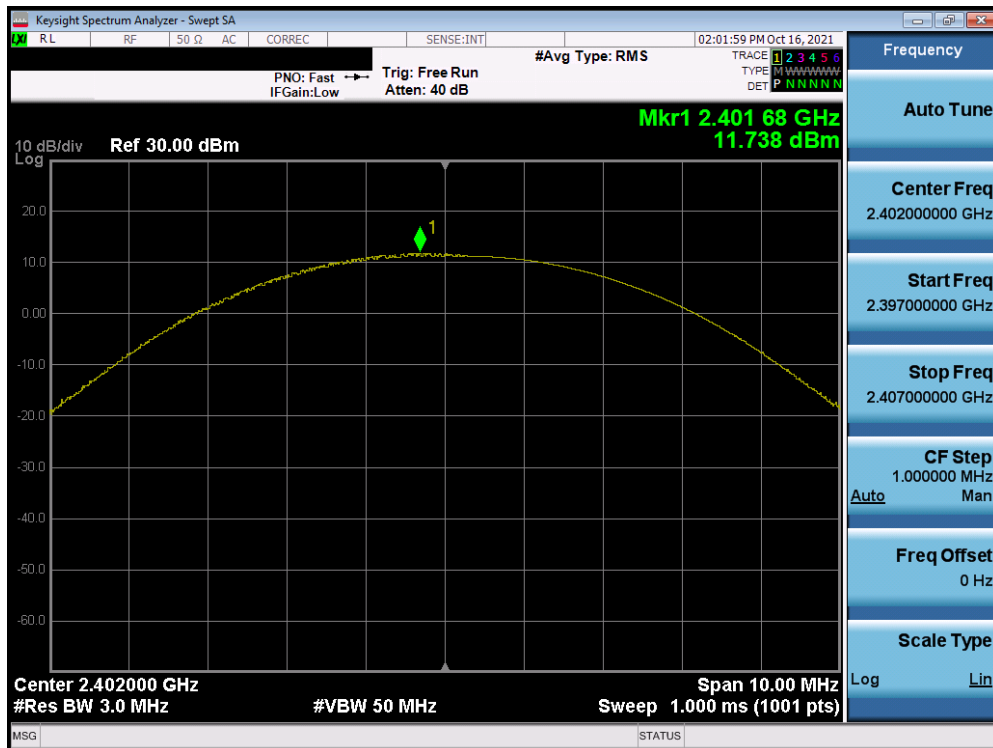


Plot 7-26. Peak Power Plot (Bluetooth (LE), 125kbps, iPA – Ch. 19) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 29 of 128

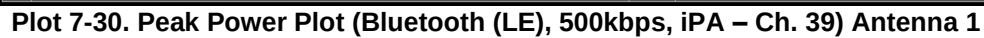
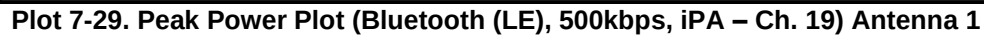


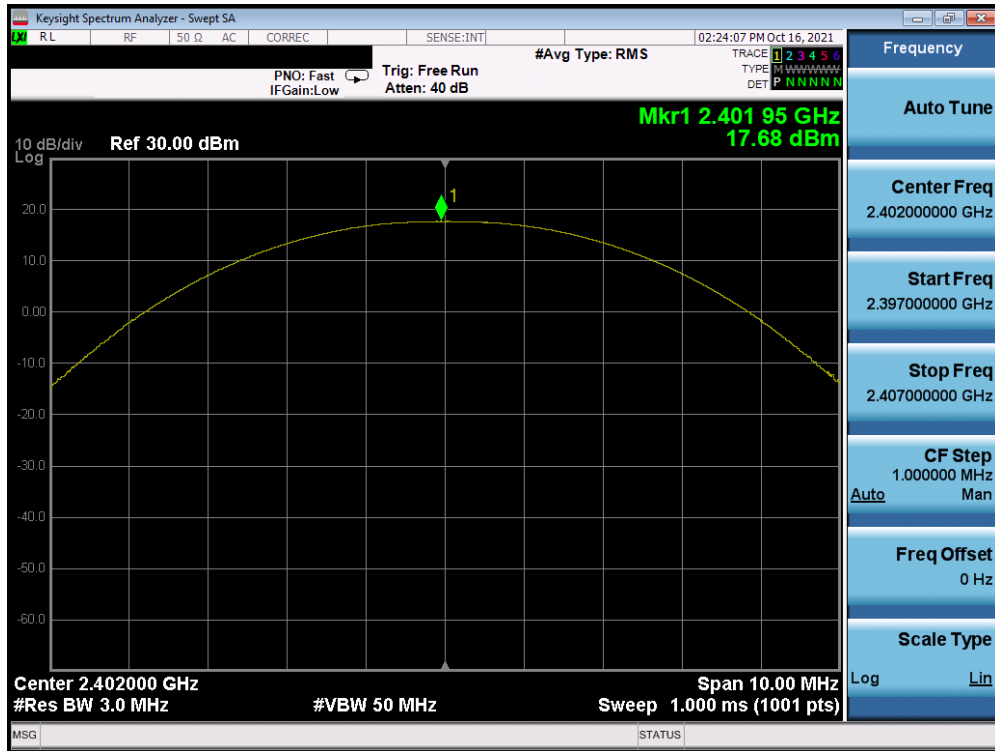
Plot 7-27. Peak Power Plot (Bluetooth (LE), 125kbps, iPA – Ch. 39) Antenna 1



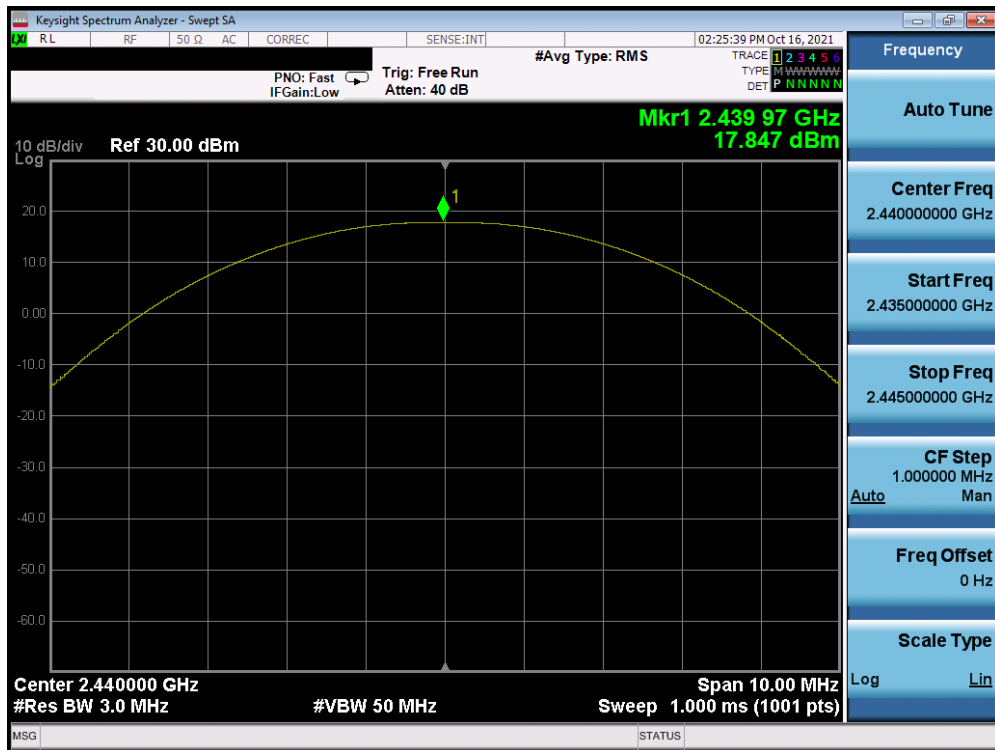
Plot 7-28. Peak Power Plot (Bluetooth (LE), 500kbps, iPA – Ch. 0) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 30 of 128

V 10.4 5/21/2021

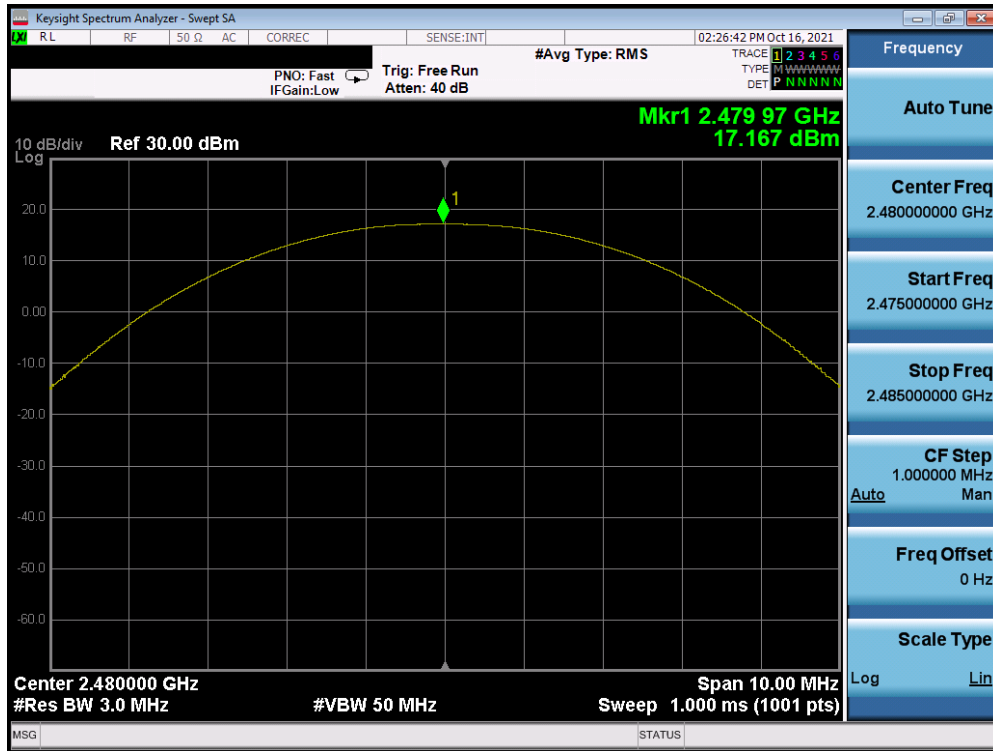


Plot 7-31. Peak Power Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 0) Antenna 1

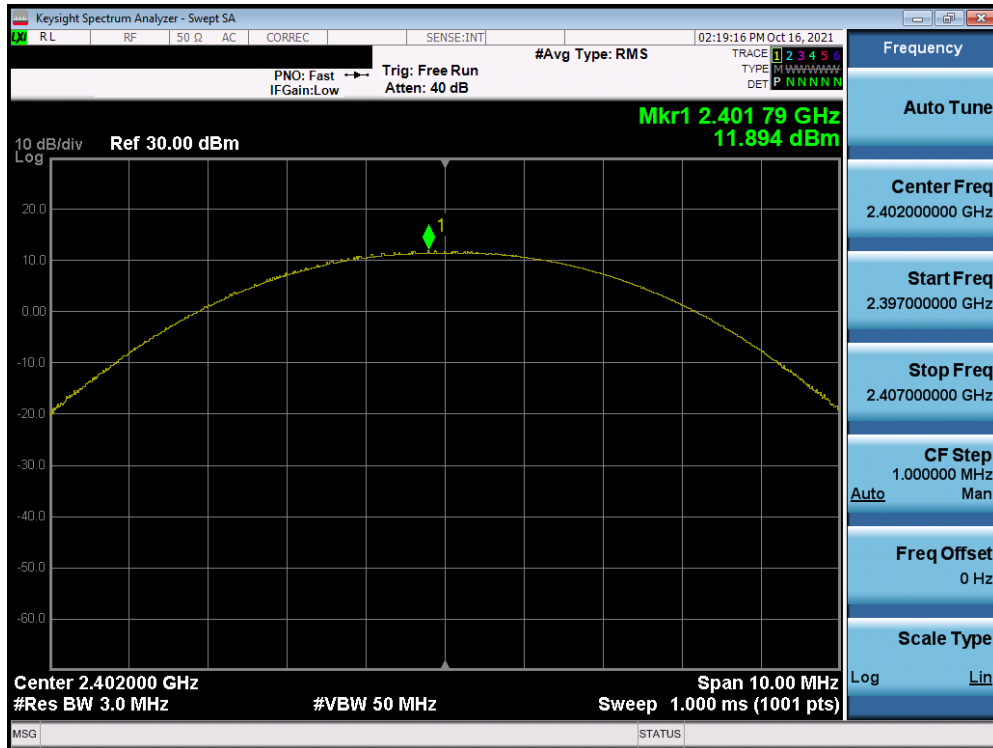


Plot 7-32. Peak Power Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 19) Antenna 1

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 32 of 128

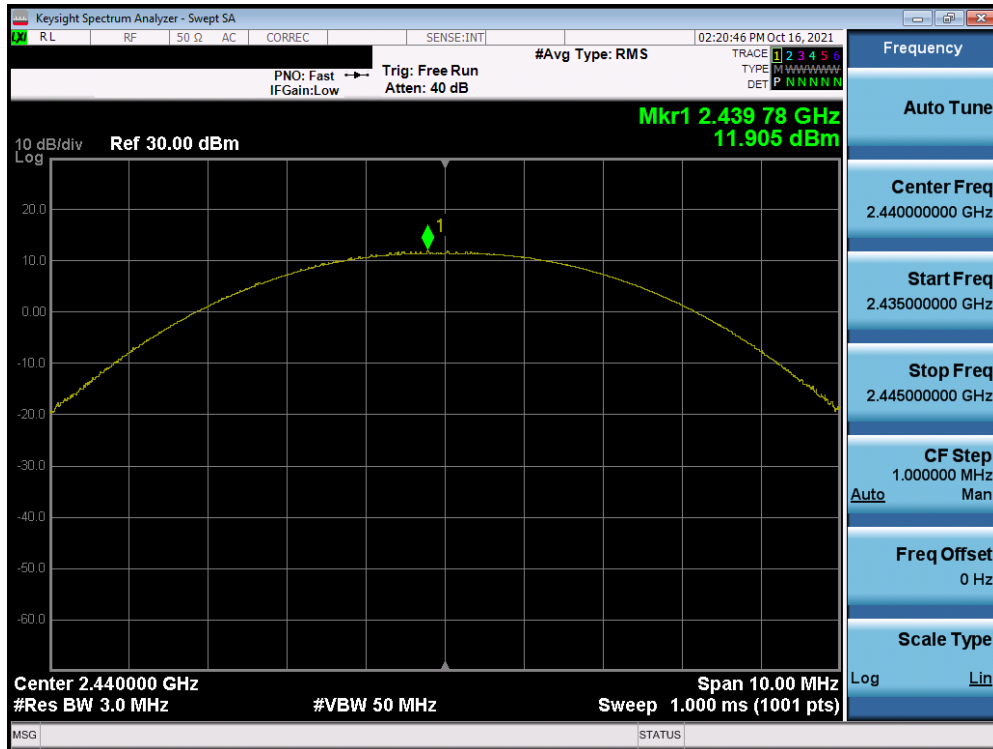


Plot 7-33. Peak Power Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 39) Antenna 1

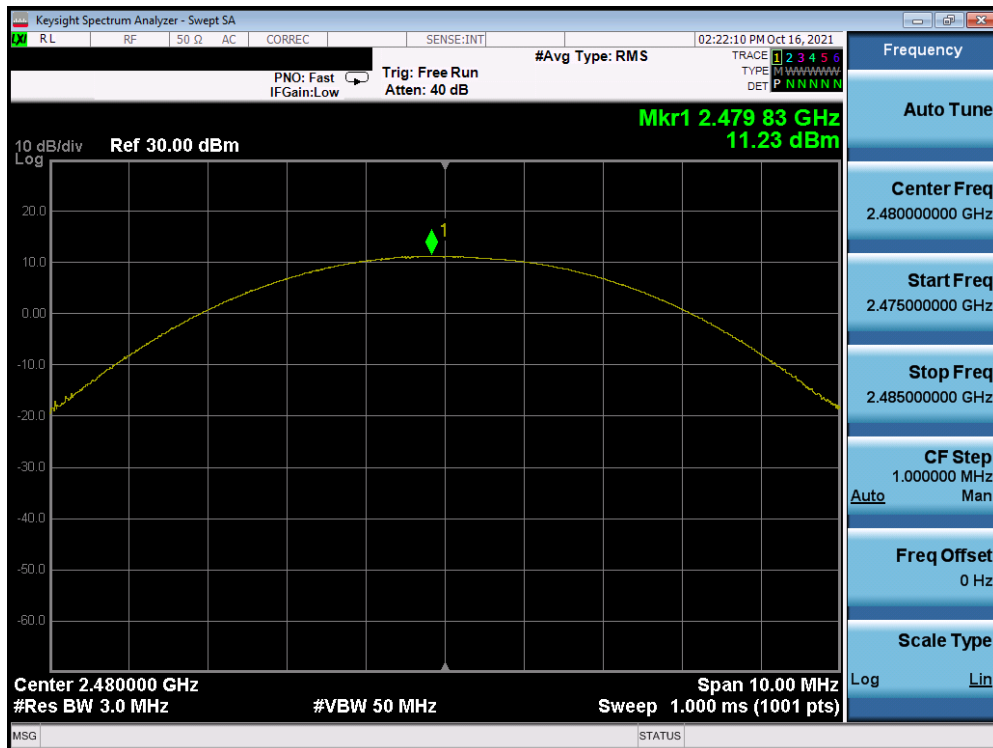


Plot 7-34. Peak Power Plot (Bluetooth (LE), 1Mbps, iPA – Ch. 0) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 33 of 128

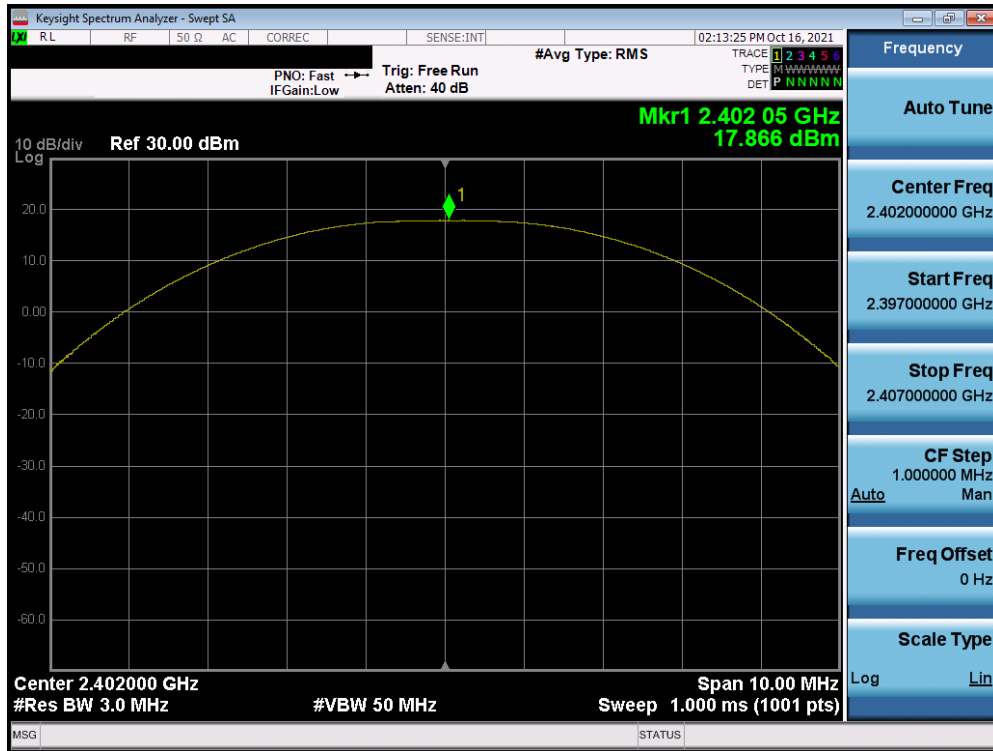


Plot 7-35. Peak Power Plot (Bluetooth (LE), 1Mbps, iPA – Ch. 19) Antenna 1

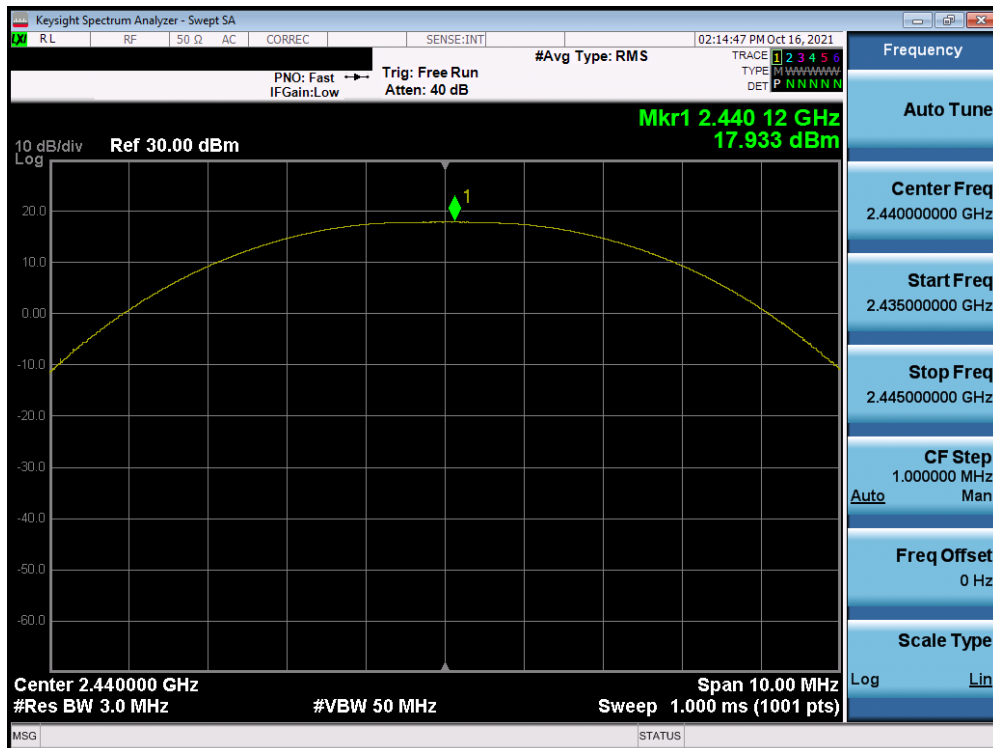


Plot 7-36. Peak Power Plot (Bluetooth (LE), 1Mbps, iPA – Ch. 39) Antenna 1

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 34 of 128

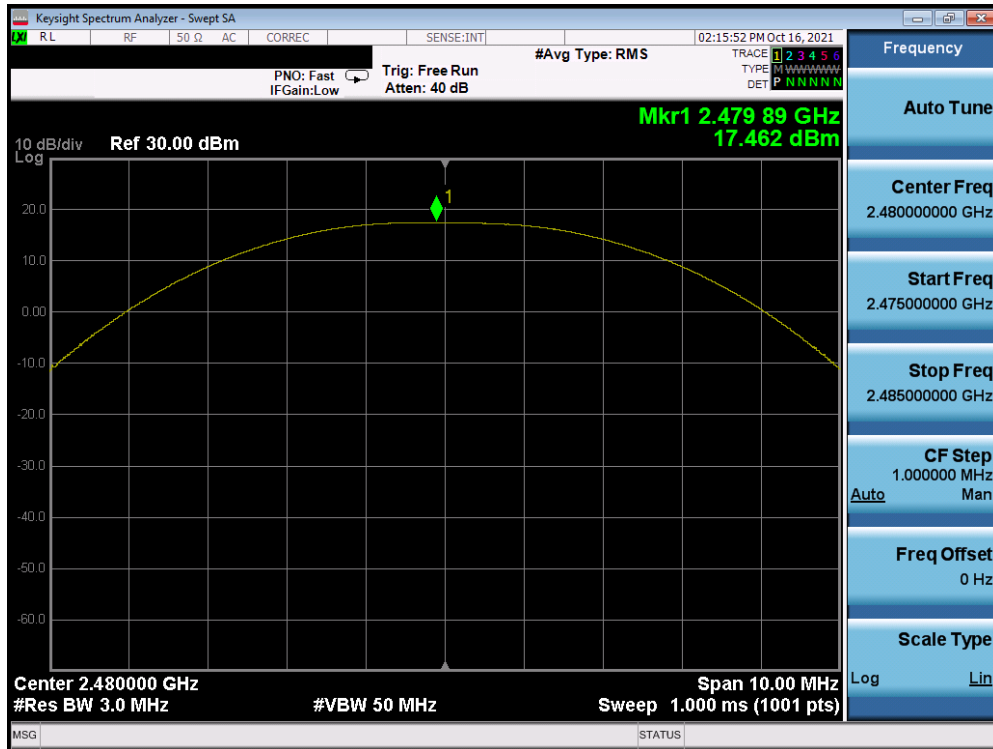


Plot 7-37. Peak Power Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 0) Antenna 1

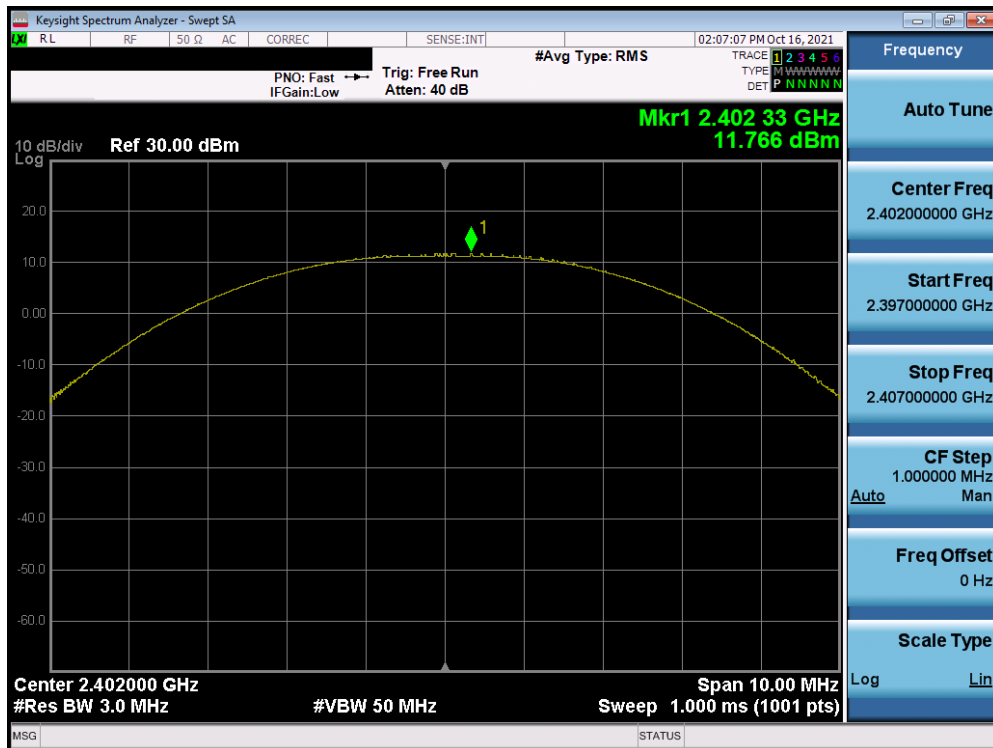


Plot 7-38. Peak Power Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 19) Antenna 1

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 35 of 128

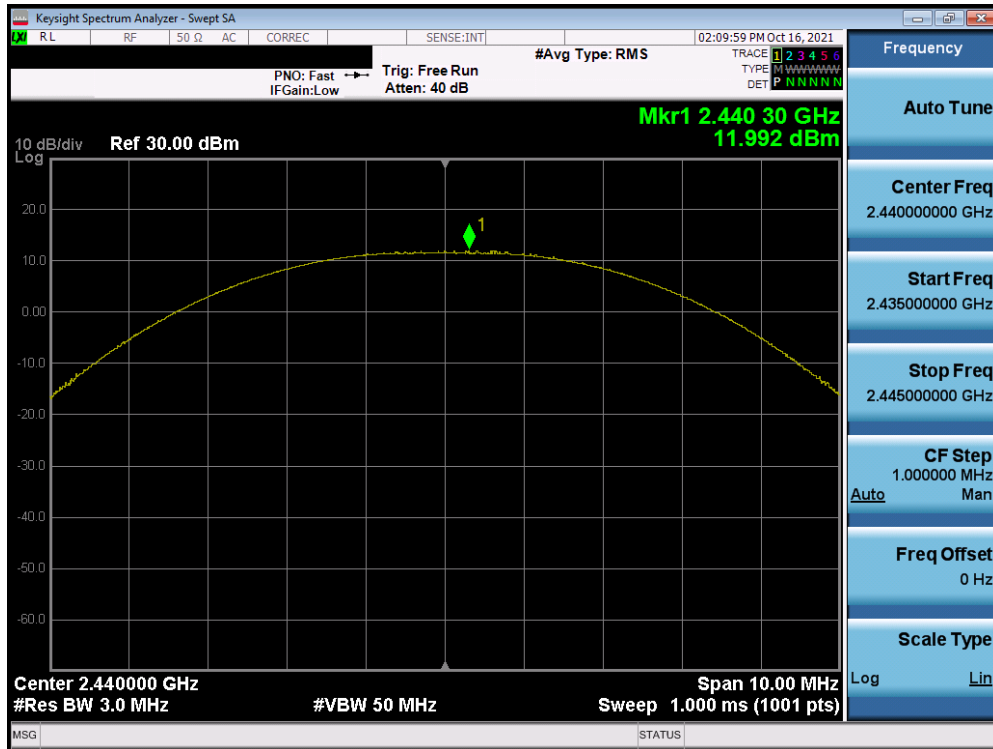


Plot 7-39. Peak Power Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 39) Antenna 1

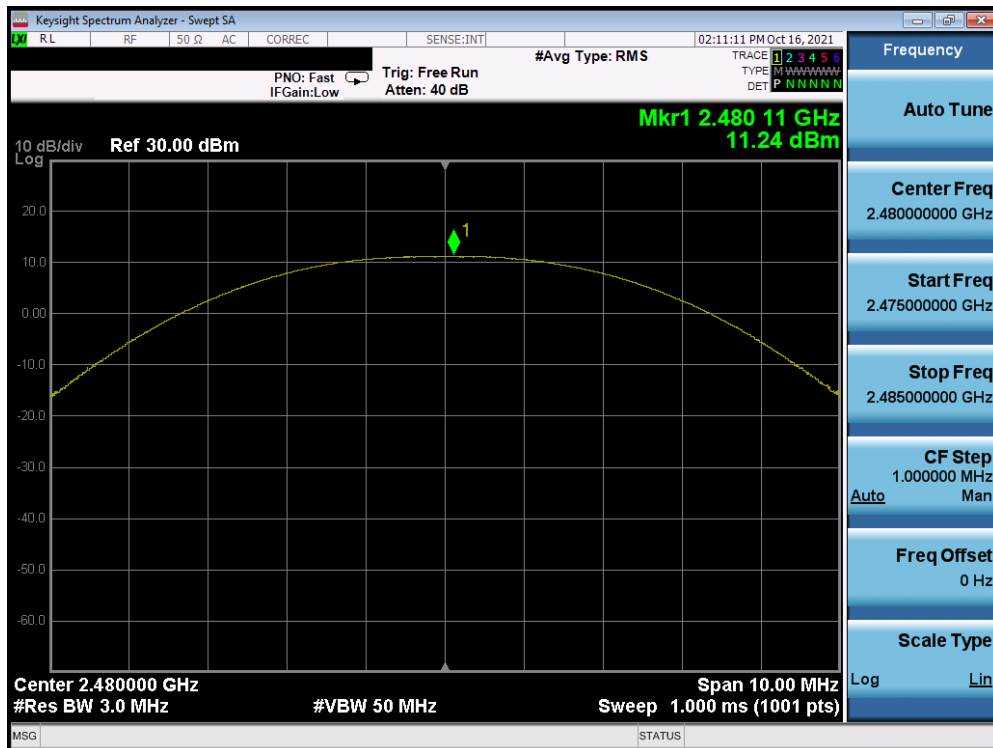


Plot 7-40. Peak Power Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 0) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 36 of 128



Plot 7-41. Peak Power Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 19) Antenna 1



Plot 7-42. Peak Power Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 39) Antenna 1

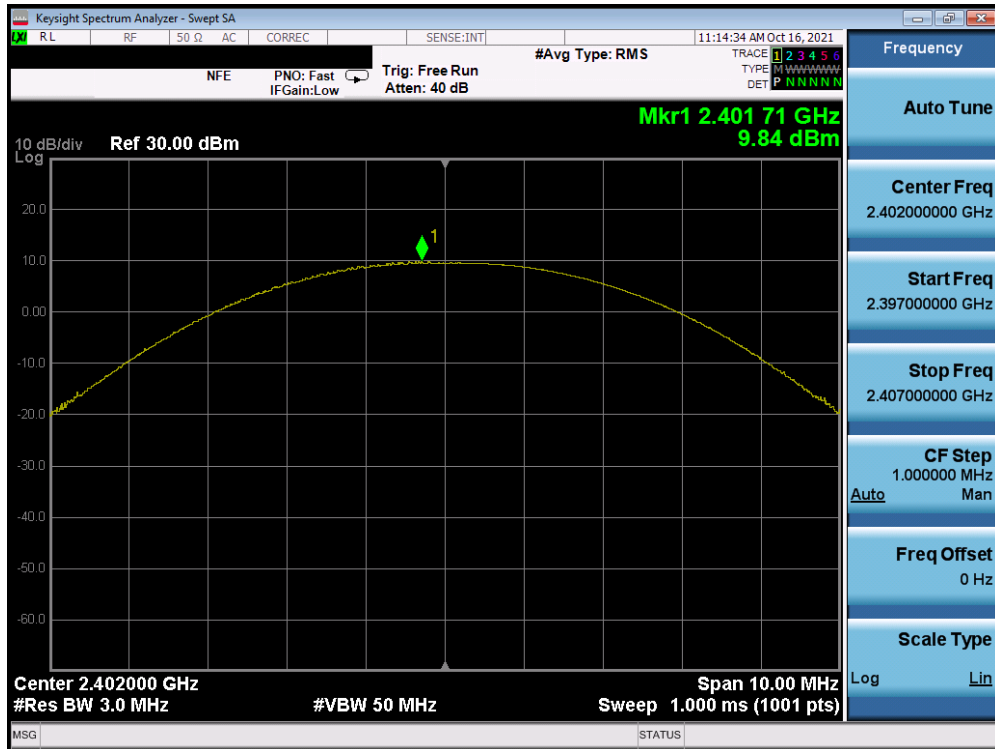
FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 37 of 128

Antenna 2

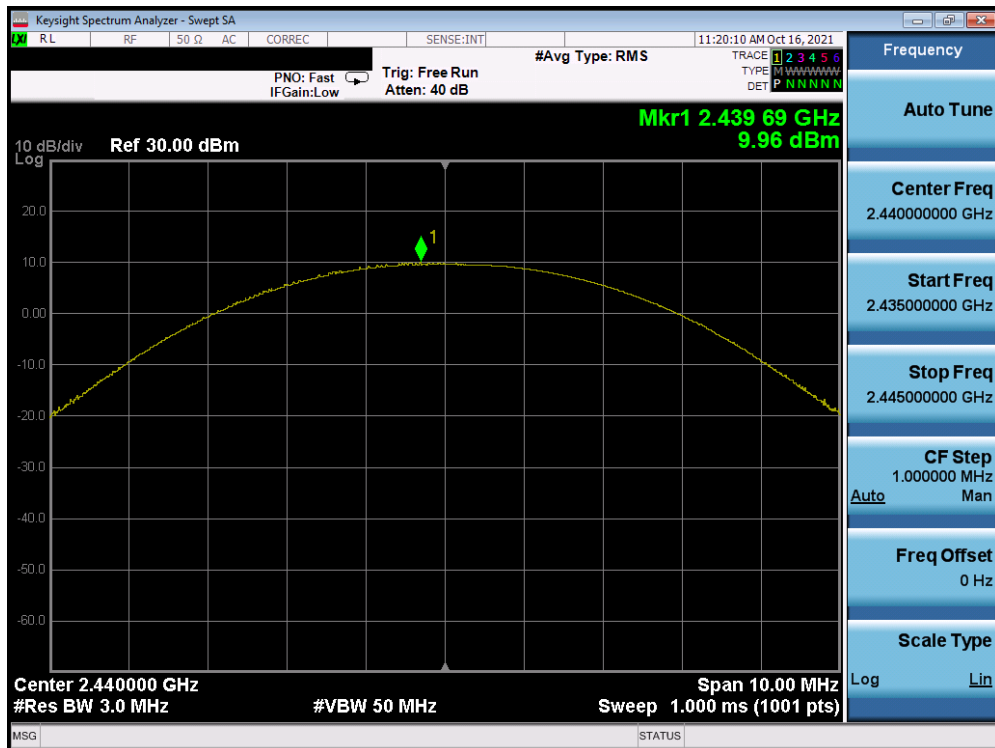
Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Bluetooth Mode	Peak Conducted Power	
					[dBm]	[mW]
2402	125 kbps	iPA	0	LE	9.84	9.647
2440	125 kbps	iPA	19	LE	9.96	9.897
2480	125 kbps	iPA	39	LE	9.07	8.078
2402	500 kbps	iPA	0	LE	9.89	9.748
2440	500 kbps	iPA	19	LE	9.92	9.827
2480	500 kbps	iPA	39	LE	9.07	8.076
2402	1 Mbps	ePA	0	LE	15.76	37.636
2440	1 Mbps	ePA	19	LE	15.67	36.864
2480	1 Mbps	ePA	39	LE	15.11	32.464
2402	1 Mbps	iPA	0	LE	9.85	9.661
2440	1 Mbps	iPA	19	LE	9.93	9.838
2480	1 Mbps	iPA	39	LE	9.09	8.115
2402	2 Mbps	ePA	0	LE	15.87	38.654
2440	2 Mbps	ePA	19	LE	15.71	37.248
2480	2 Mbps	ePA	39	LE	15.34	34.190
2402	2 Mbps	iPA	0	LE	9.69	9.307
2440	2 Mbps	iPA	19	LE	9.98	9.961
2480	2 Mbps	iPA	39	LE	9.25	8.418

Table 7-5. Conducted Output Power Measurements (Bluetooth LE) Antenna 2

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 38 of 128

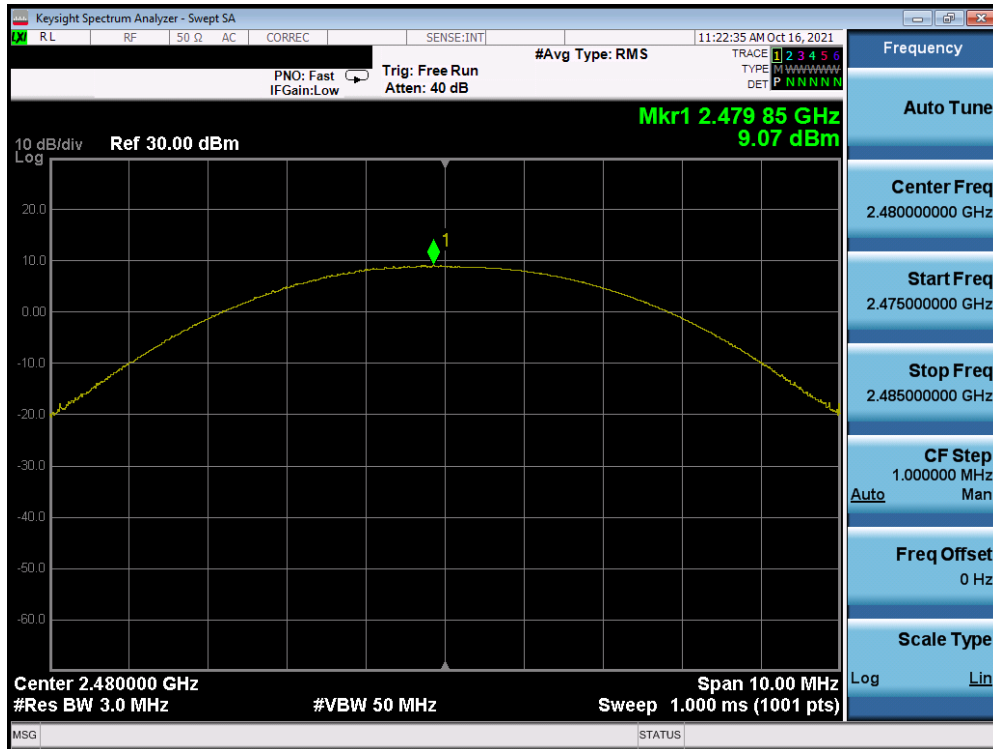


Plot 7-43. Peak Power Plot (Bluetooth (LE), 125kbps, iPA – Ch. 0) Antenna 2

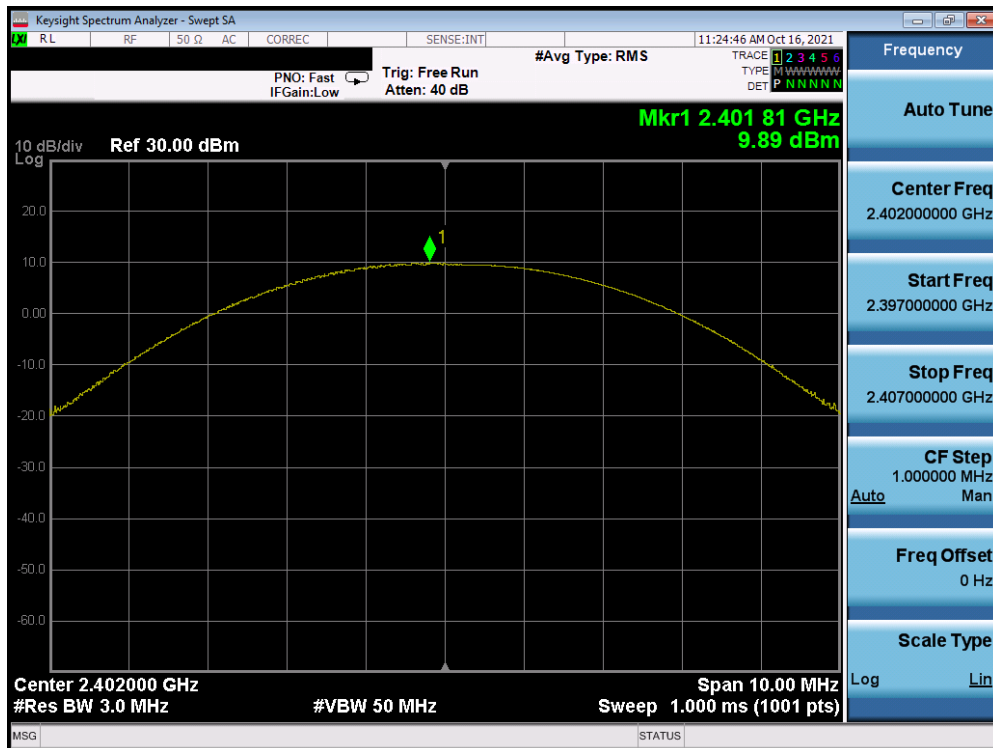


Plot 7-44. Peak Power Plot (Bluetooth (LE), 125kbps, iPA – Ch. 19) Antenna 2

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 39 of 128

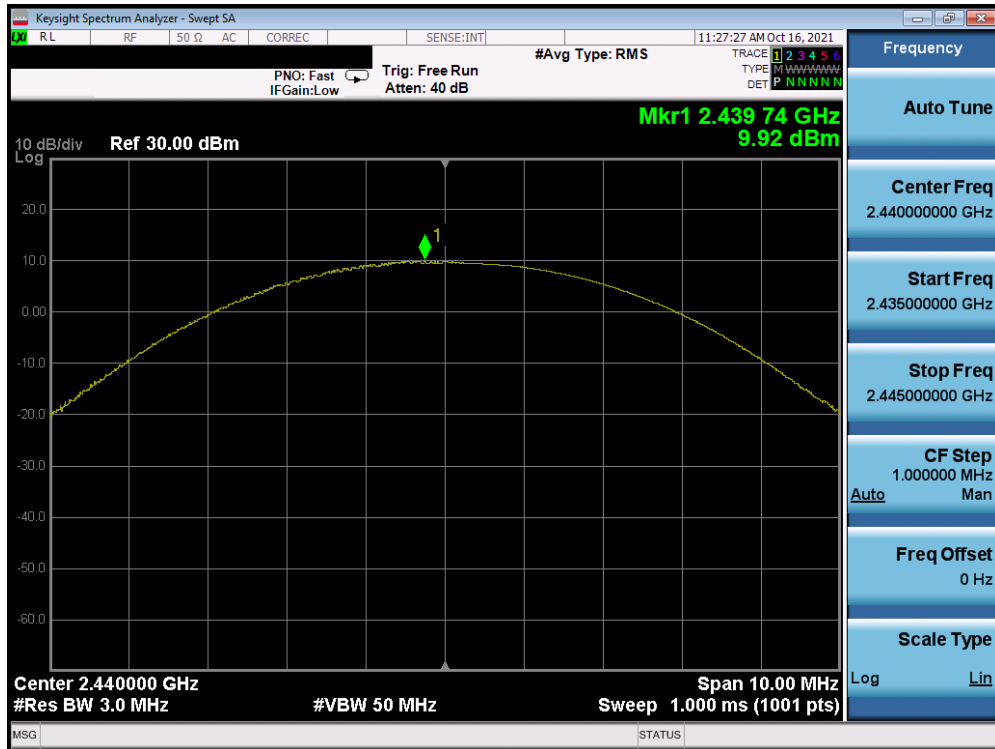


Plot 7-45. Peak Power Plot (Bluetooth (LE), 125kbps, iPA – Ch. 39) Antenna 2

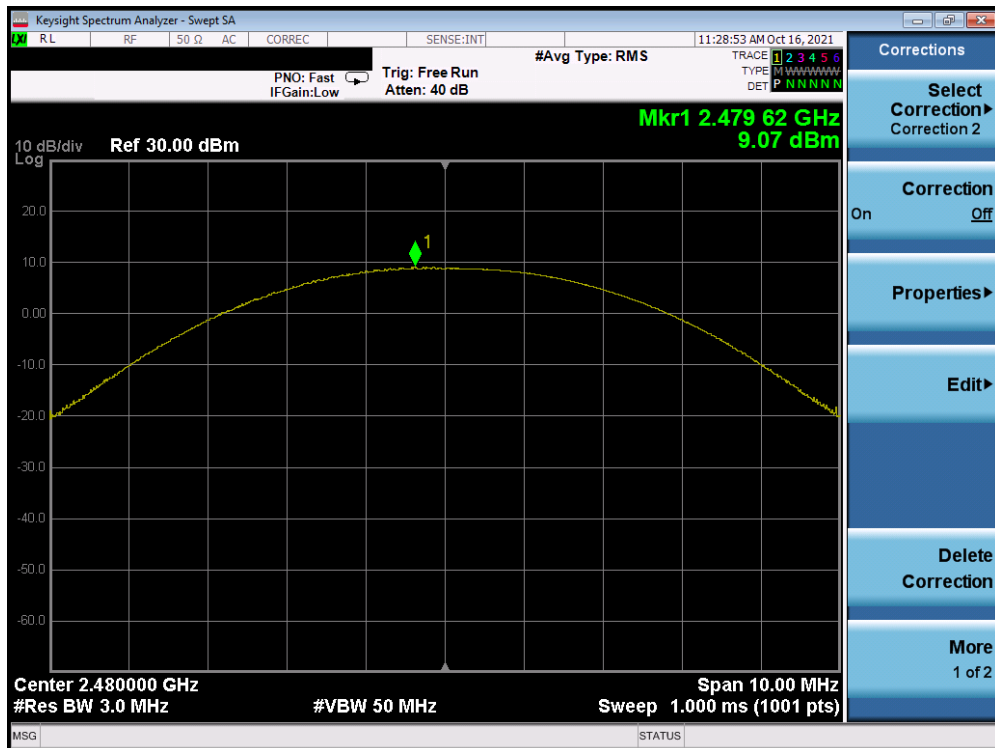


Plot 7-46. Peak Power Plot (Bluetooth (LE), 500kbps, iPA – Ch. 0) Antenna 2

FCC ID: A3LSMS908U	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 40 of 128

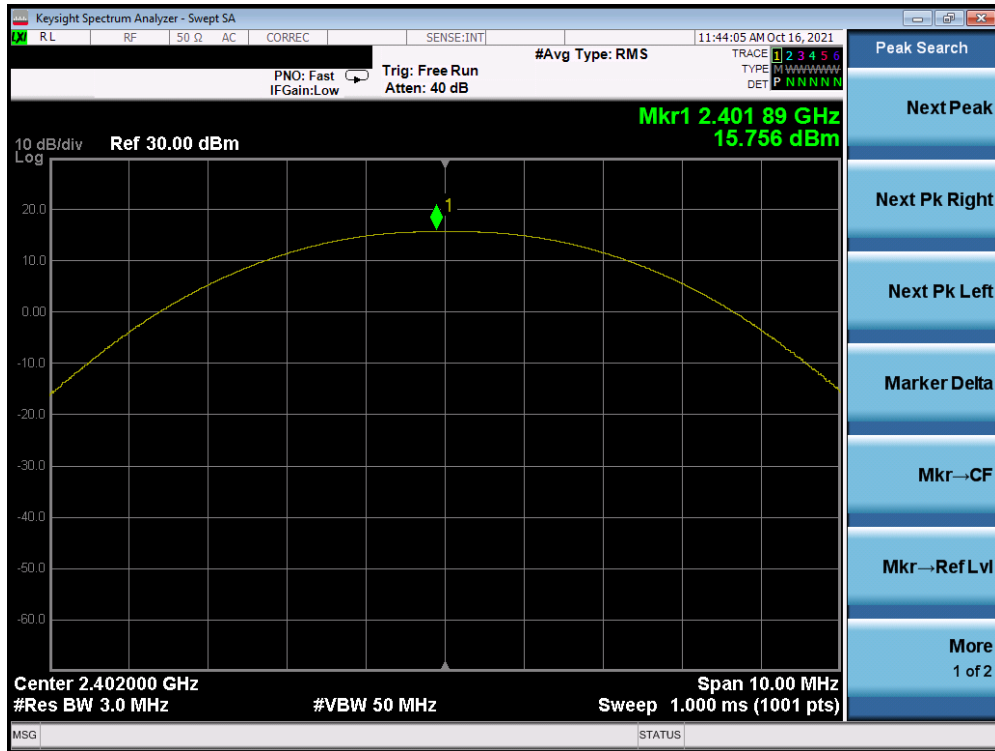


Plot 7-47. Peak Power Plot (Bluetooth (LE), 500kbps, iPA – Ch. 19) Antenna 2

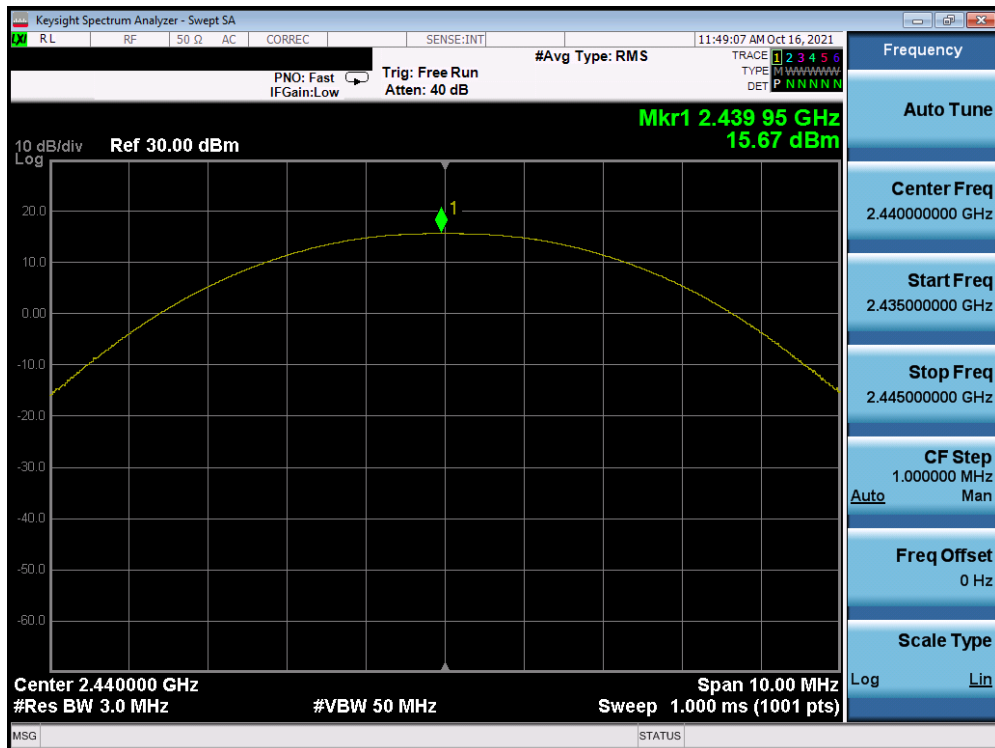


Plot 7-48. Peak Power Plot (Bluetooth (LE), 500kbps, iPA – Ch. 39) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 41 of 128

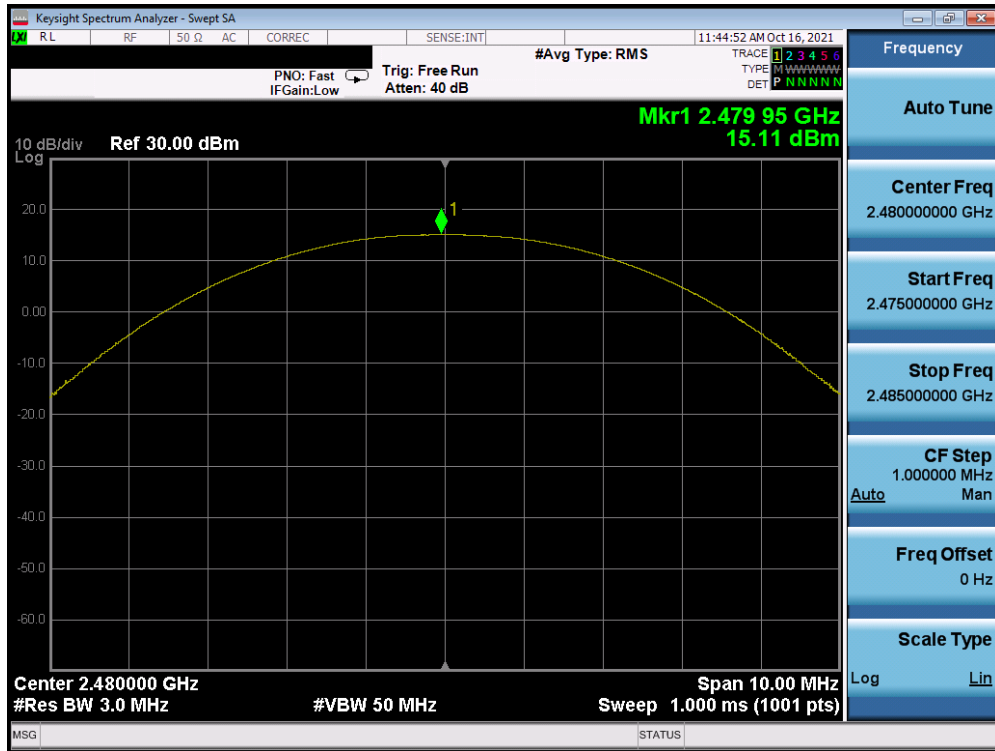


Plot 7-49. Peak Power Plot (Bluetooth (LE), 1Mbps, ePA - Ch. 0) Antenna 2

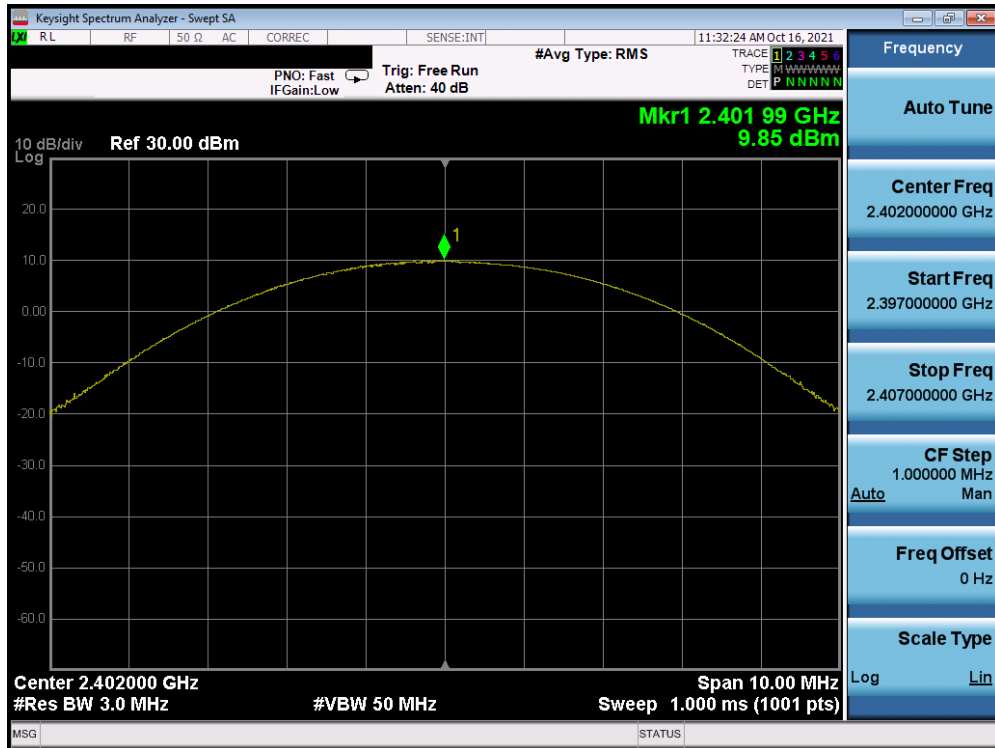


Plot 7-50. Peak Power Plot (Bluetooth (LE), 1Mbps, ePA - Ch. 19) Antenna 2

FCC ID: A3LSMS908U	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 42 of 128

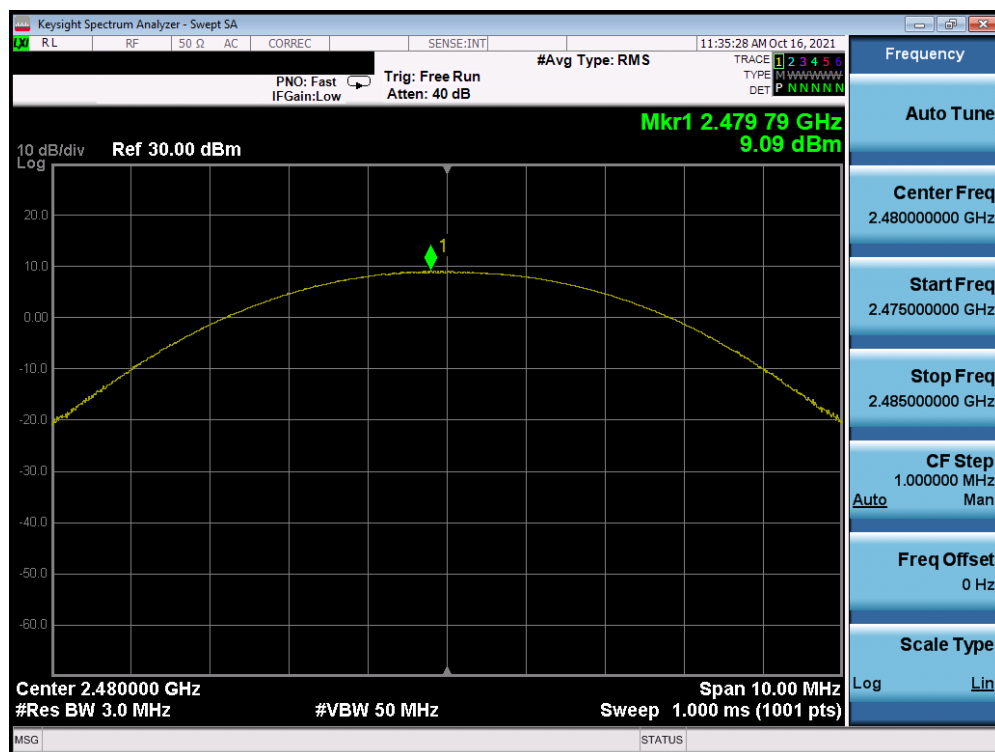
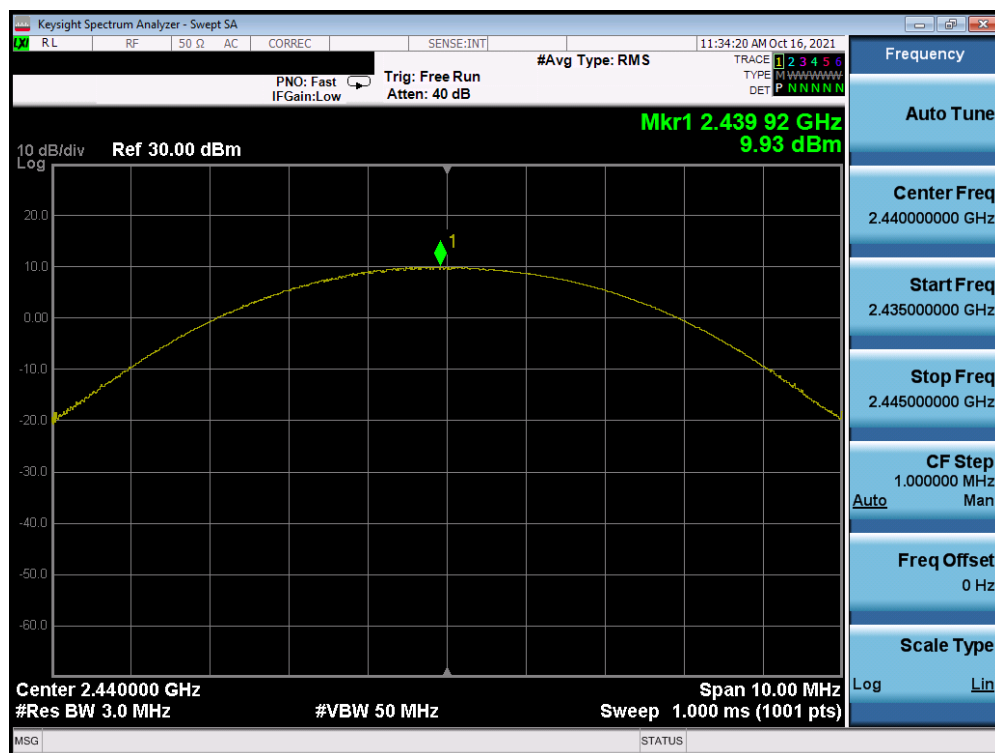


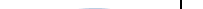
Plot 7-51. Peak Power Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 39) Antenna 2

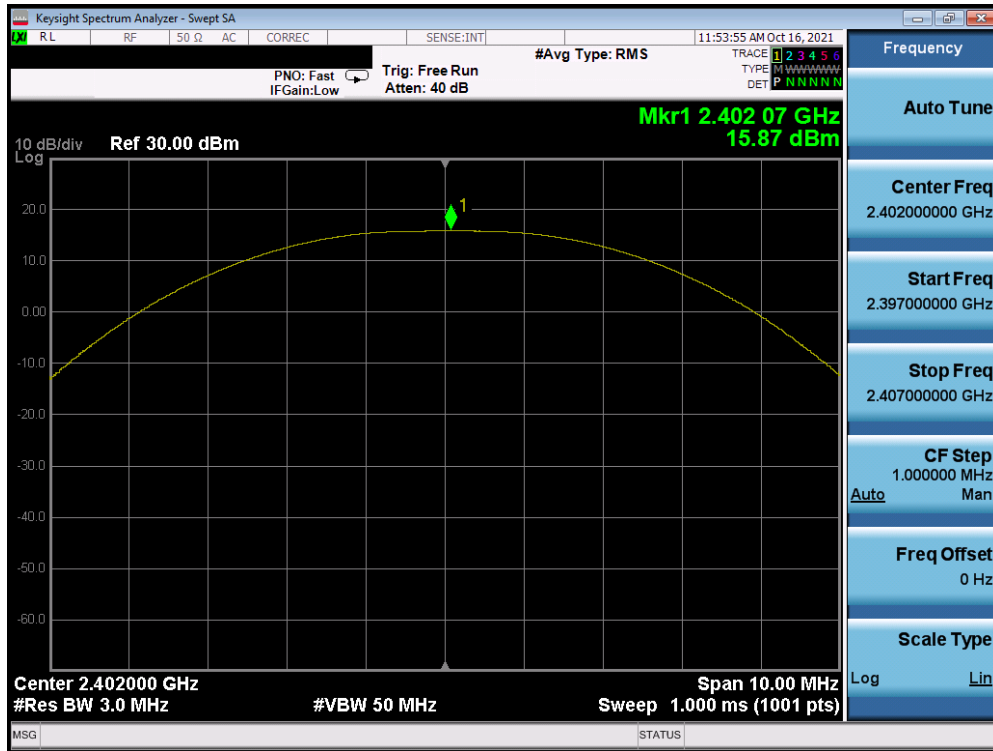


Plot 7-52. Peak Power Plot (Bluetooth (LE), 1Mbps, iPA – Ch. 0) Antenna 2

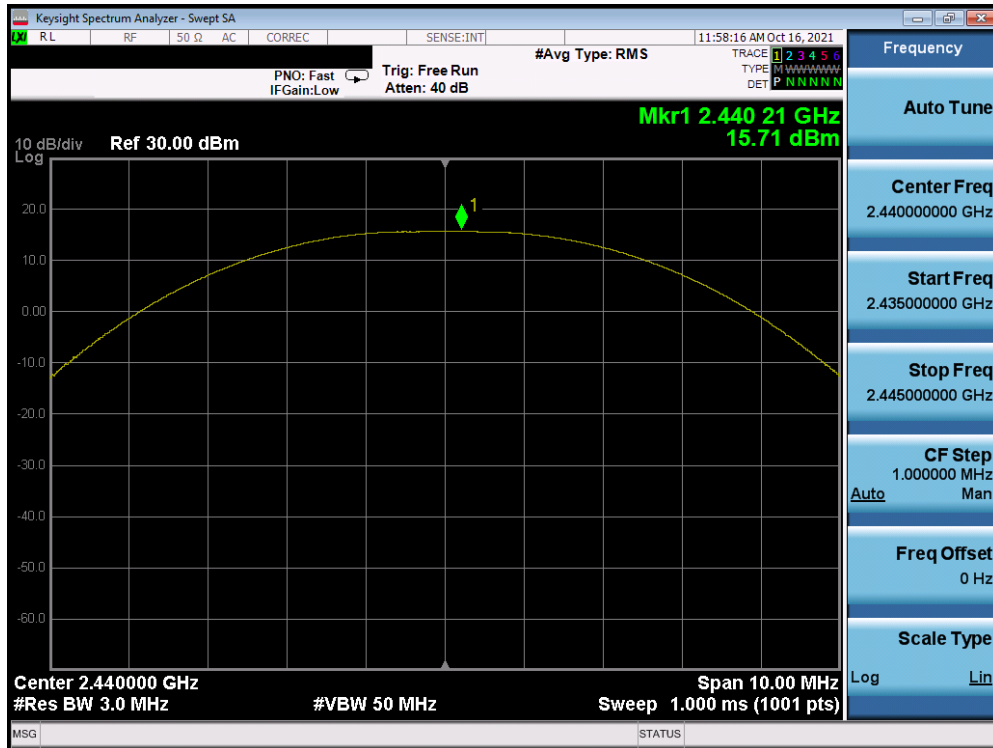
FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 43 of 128



FCC ID: A3LSMS908U	 MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset	Page 44 of 128

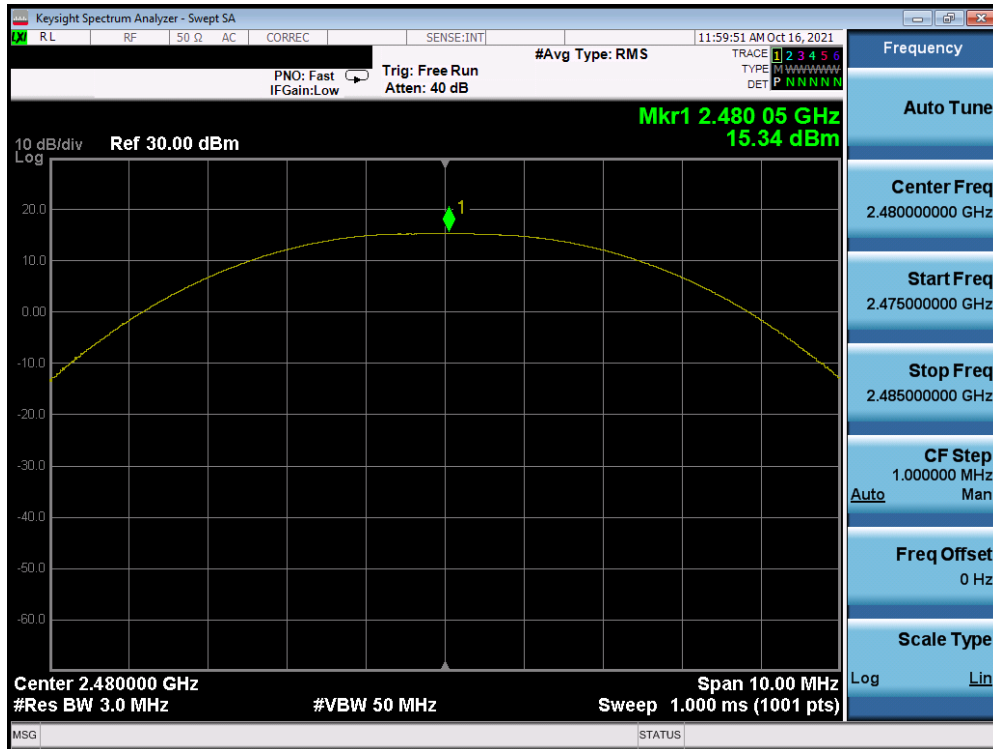


Plot 7-55. Peak Power Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 0) Antenna 2

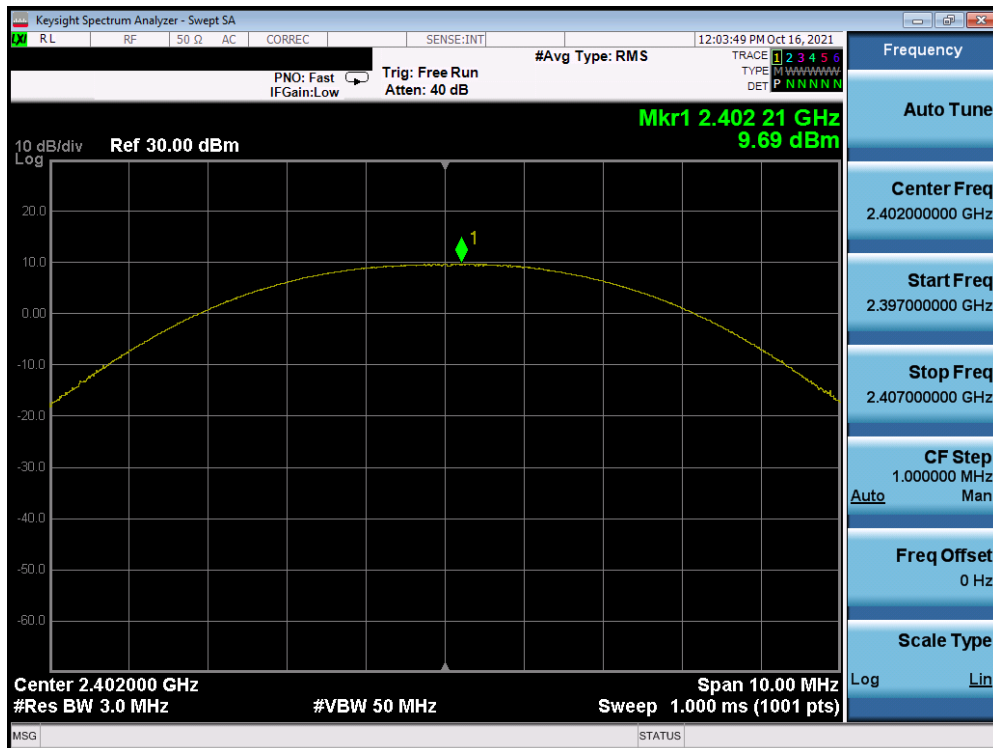


Plot 7-56. Peak Power Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 19) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 45 of 128

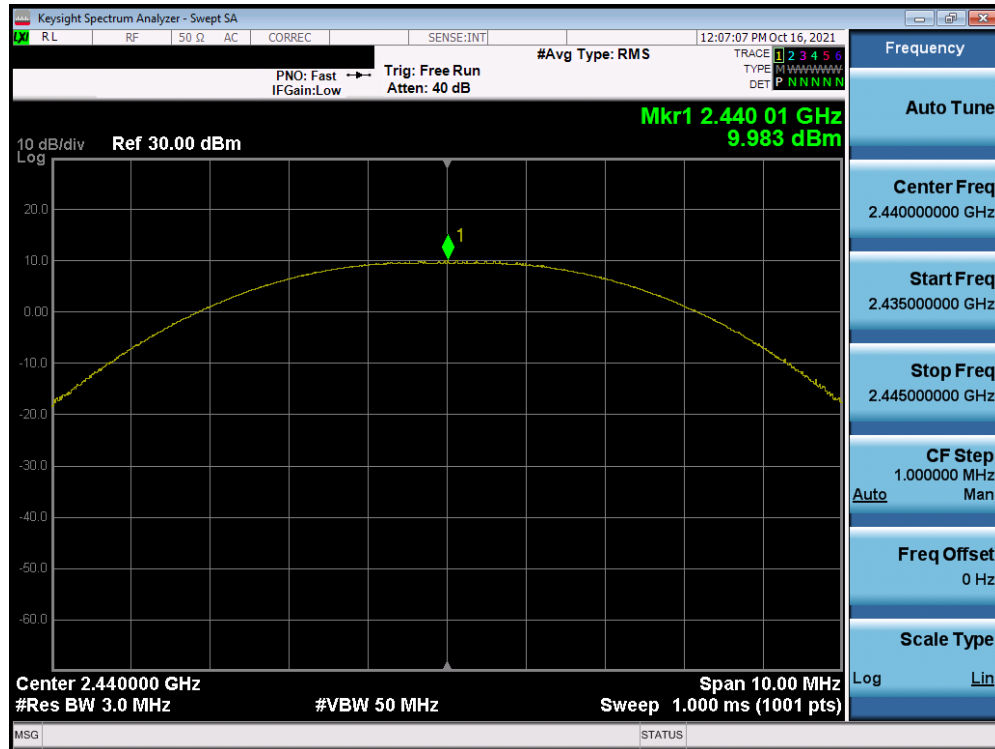


Plot 7-57. Peak Power Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 39) Antenna 2

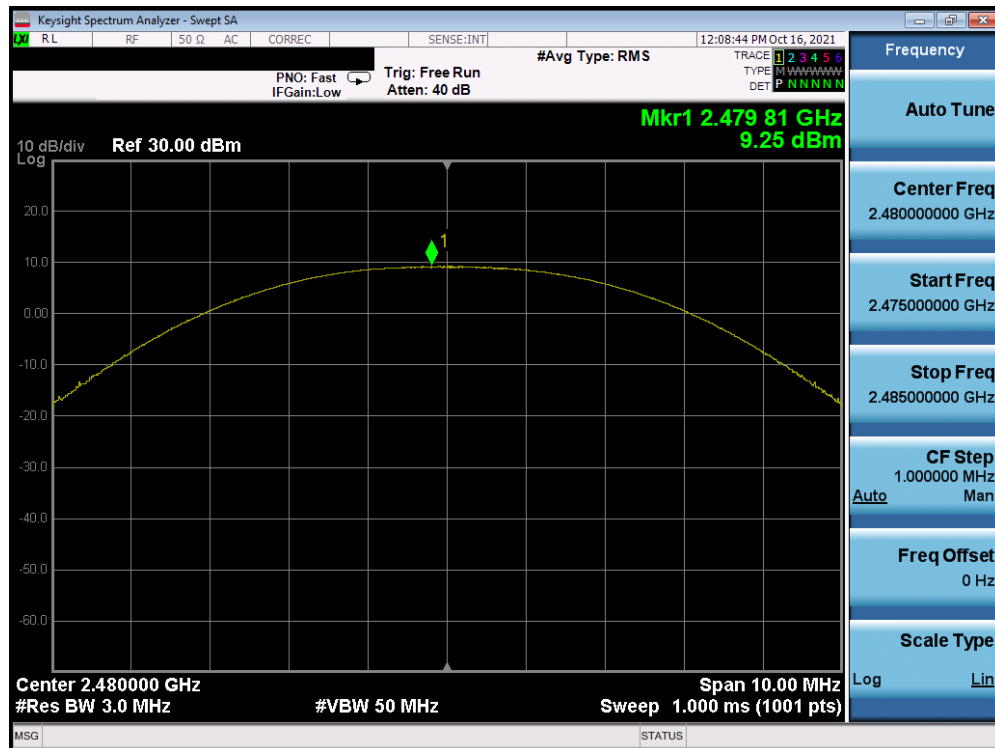


Plot 7-58. Peak Power Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 0) Antenna 2

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-59. Peak Power Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 19) Antenna 2



Plot 7-60. Peak Power Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 39) Antenna 2

FCC ID: A3LSMS908U	 Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Dual Antenna

Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Bluetooth Mode	Peak Conducted Power Ant 1		Peak Conducted Power Ant 2		Peak Conducted Power Dual	
					[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]
2402	1 Mbps	iPA	0	LE	11.62	14.534	9.51	8.939	13.71	23.474
2440	1 Mbps	iPA	19	LE	11.68	14.723	9.98	9.956	13.92	24.679
2480	1 Mbps	iPA	39	LE	10.82	12.078	9.16	8.238	13.08	20.316
2402	2 Mbps	iPA	0	LE	12.00	15.849	9.57	9.061	13.96	24.910
2440	2 Mbps	iPA	19	LE	11.67	14.693	9.97	9.929	13.91	24.622
2480	2 Mbps	iPA	39	LE	11.00	12.589	9.19	8.291	13.20	20.880

Table 7-6. Conducted Output Power Measurements (Bluetooth LE) Dual Antenna

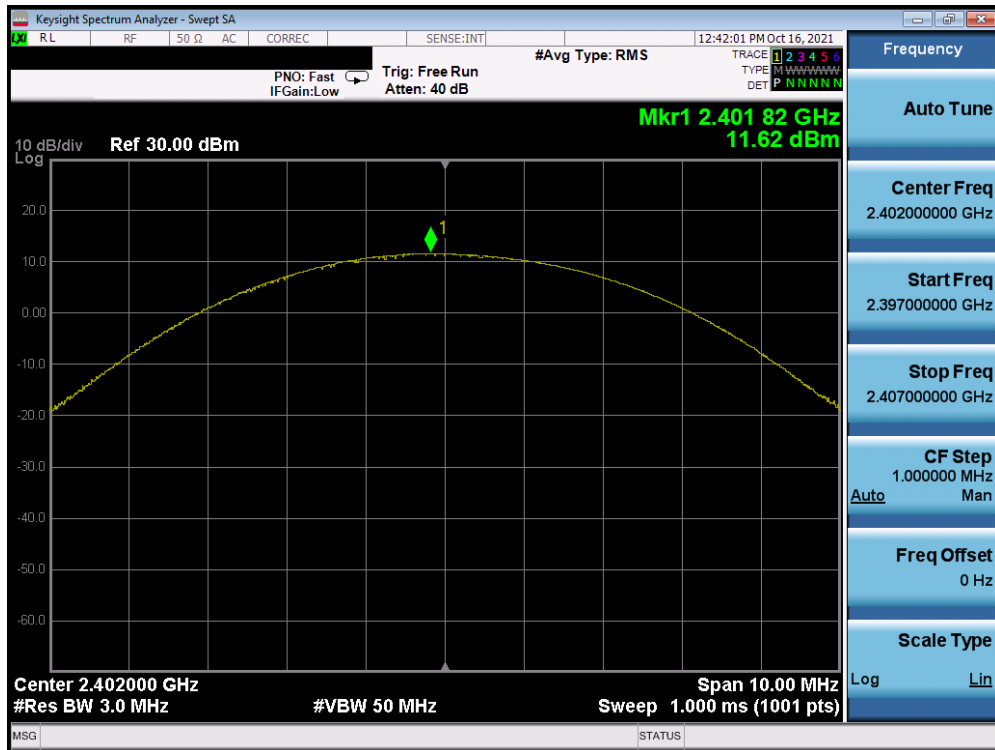
Note:

This device can operate simultaneously on two antennas. The directional gains are shown in Table 2-2 in Section 2.3 of this report. The directional gain from the operation of two antennas is shown to operate at less than 6dBi per the calculation below:

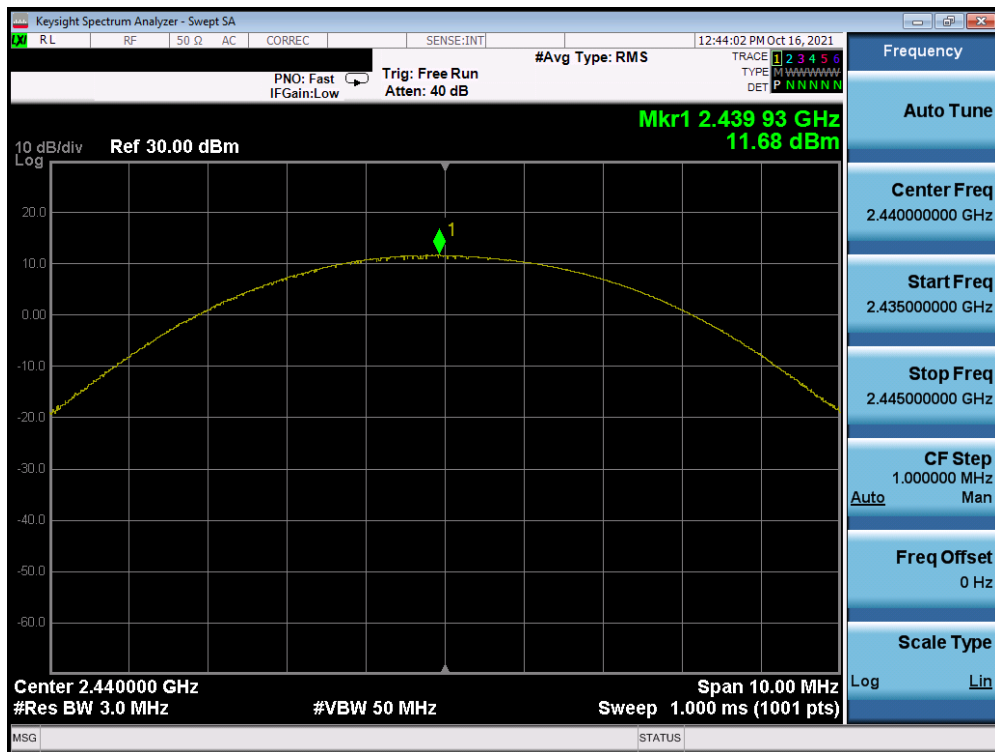
$$\begin{aligned}
 \text{Directional gain} &= 10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}] \text{ dBi} \\
 &= 10 \log[(10^{-6.82/20} + 10^{-6.12/20})^2 / 2] \text{ dBi} \\
 &= -3.45 \text{ dBi}
 \end{aligned}$$

where G_N is the gain of the nth antenna and N_{ANT} is the total number of antennas used.

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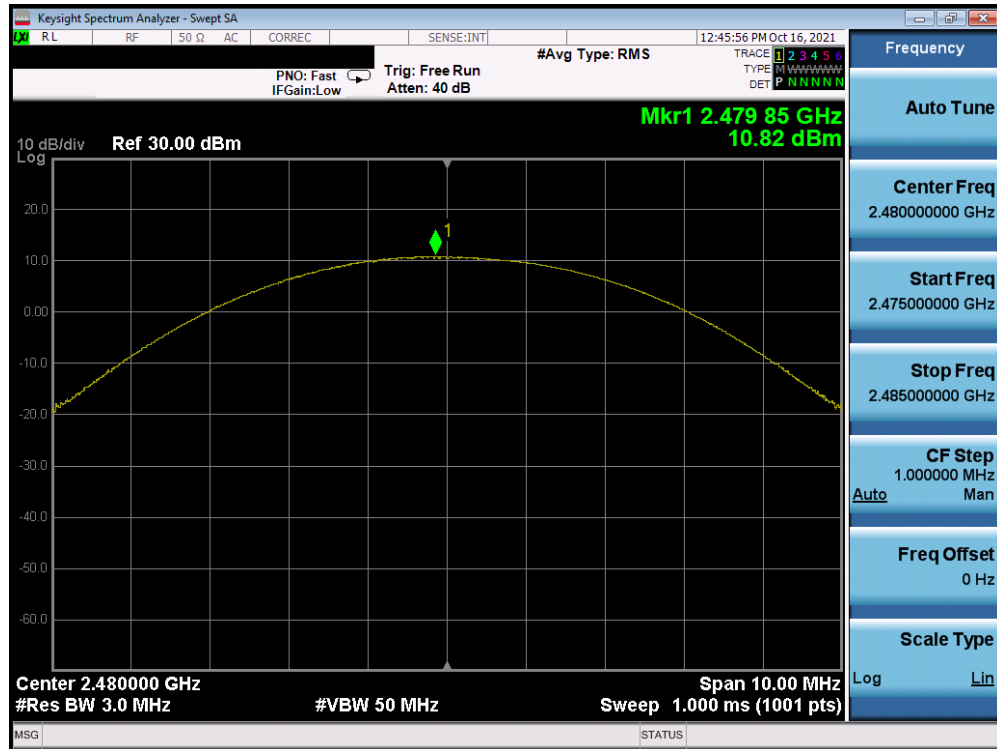


Plot 7-61. Peak Power Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 0) Antenna 1

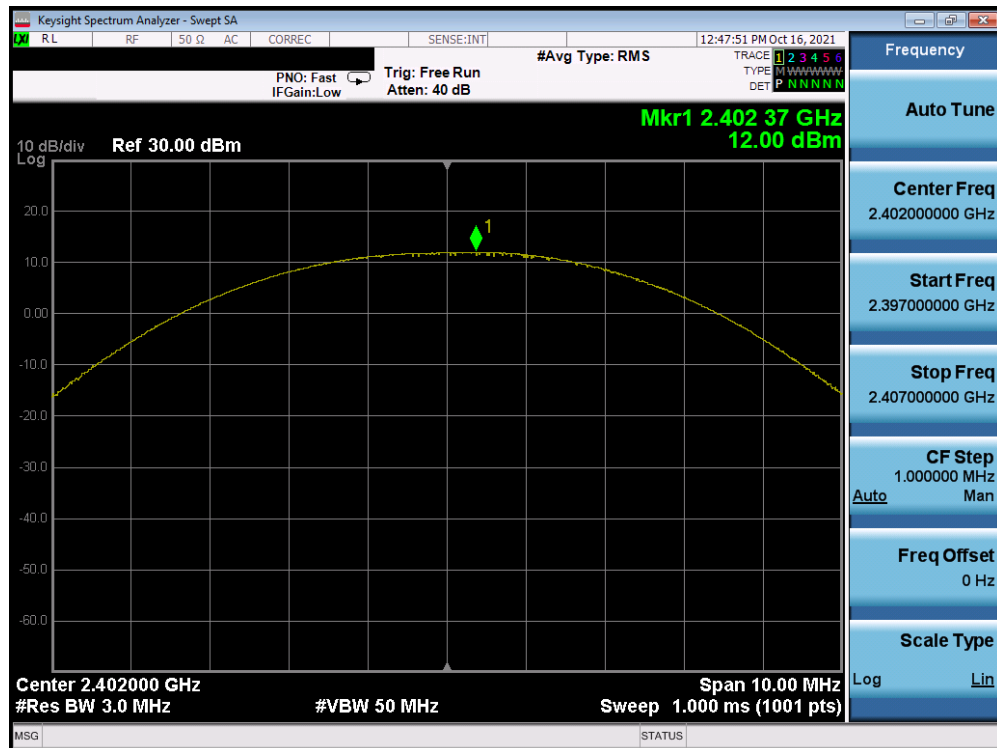


Plot 7-62. Peak Power Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 19) Antenna 1

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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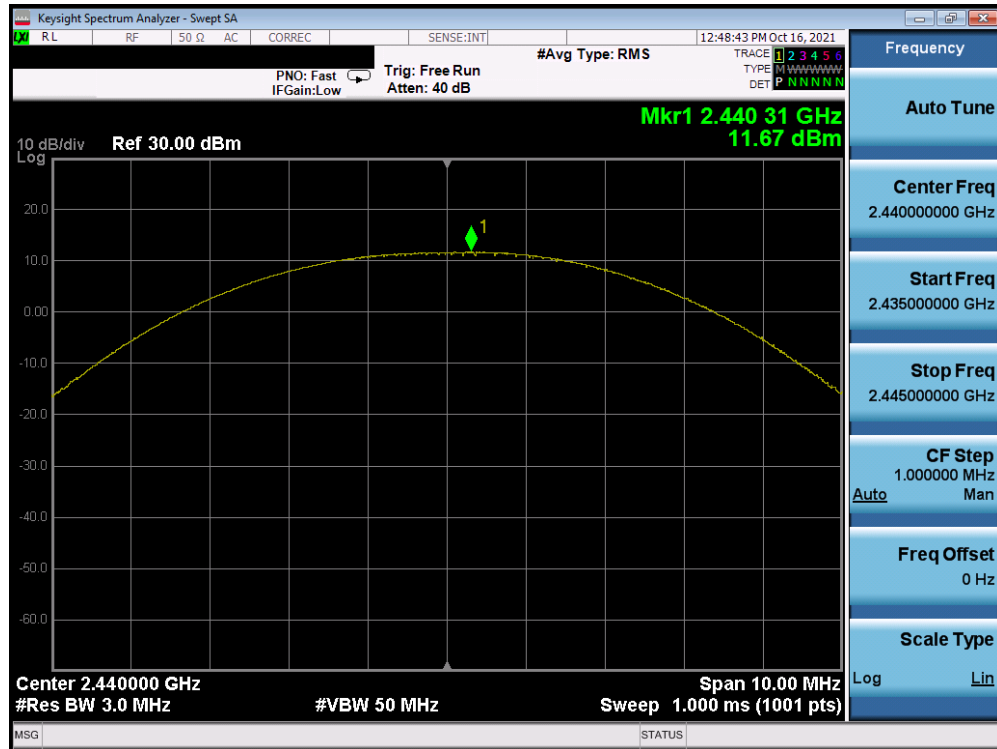


Plot 7-63. Peak Power Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 39) Antenna 1

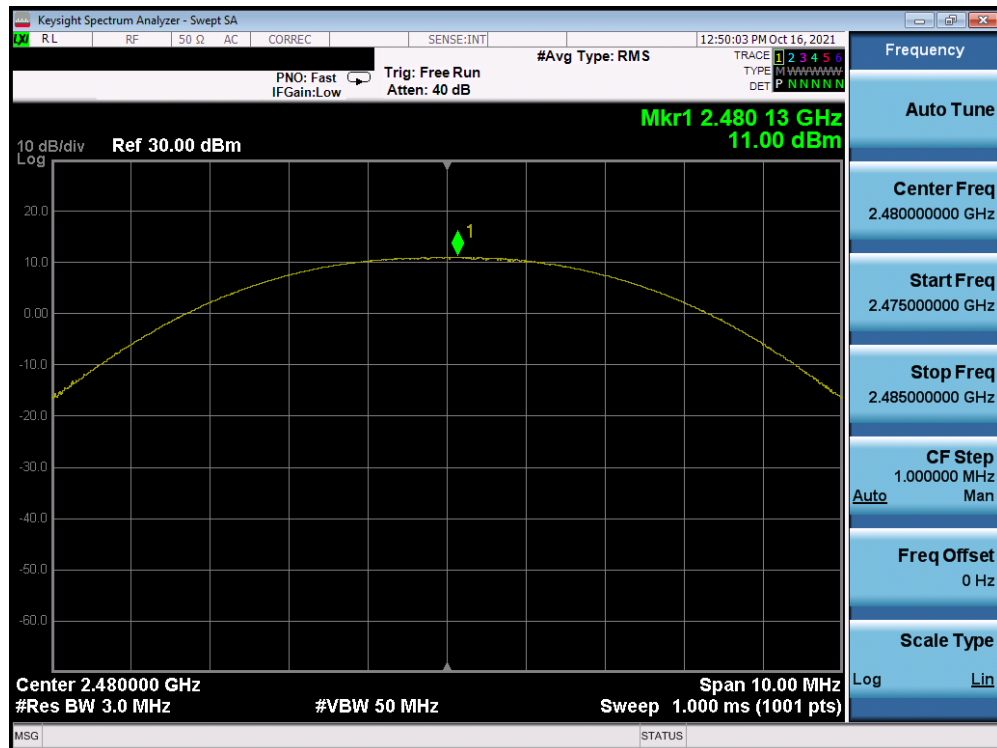


Plot 7-64. Peak Power Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 0) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 50 of 128

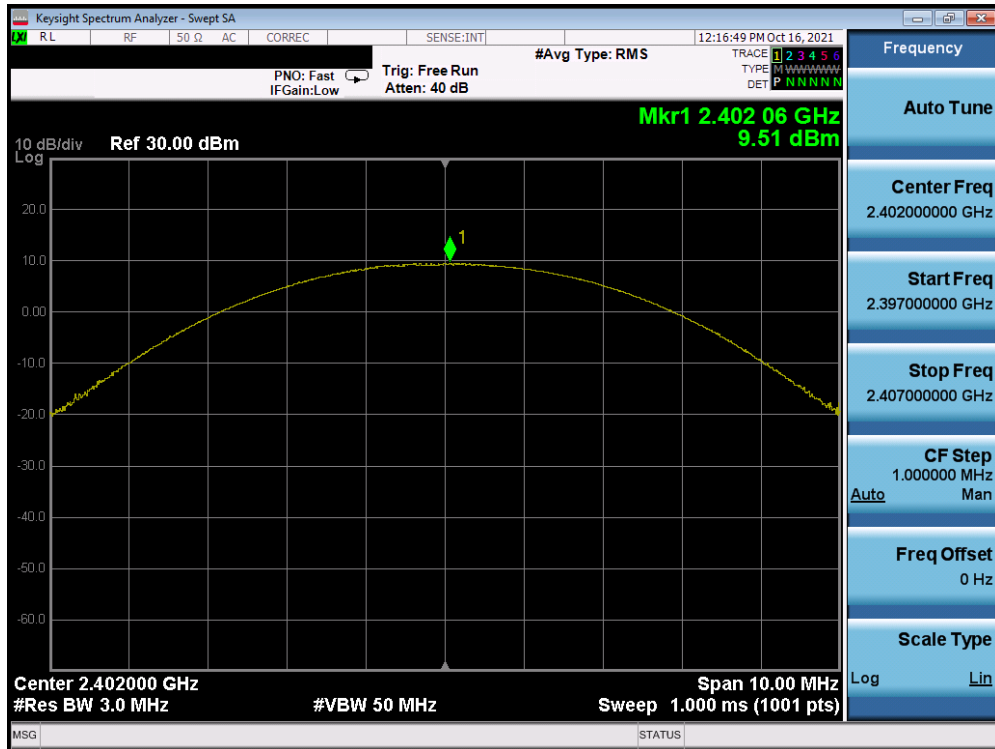


Plot 7-65. Peak Power Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 19) Antenna 1

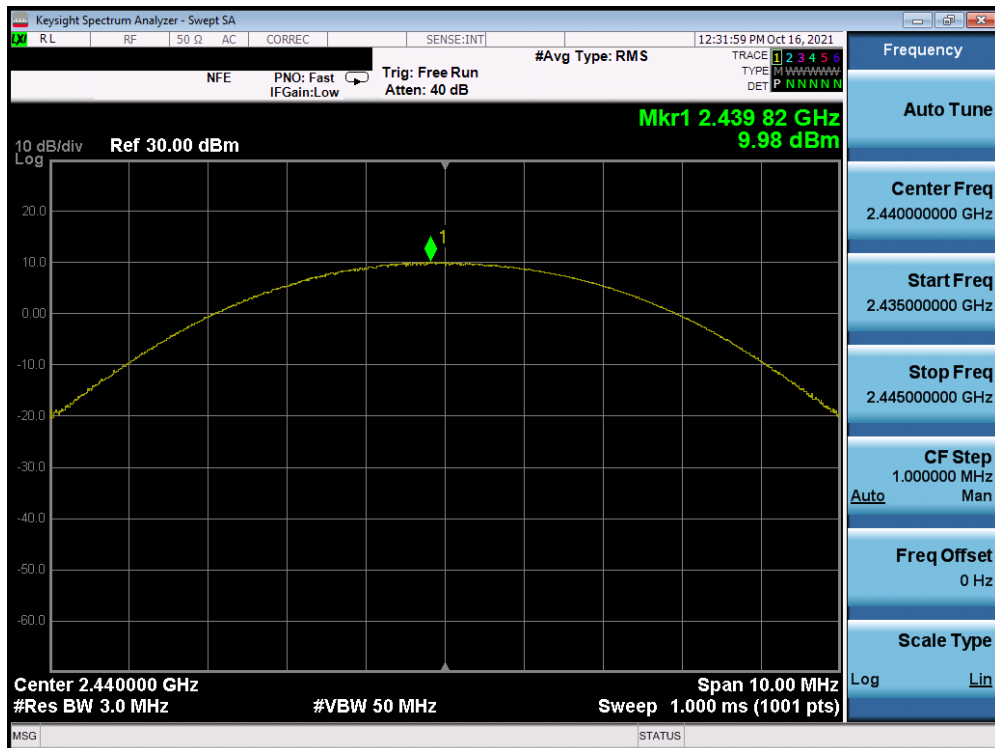


Plot 7-66. Peak Power Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 39) Antenna 1

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 51 of 128

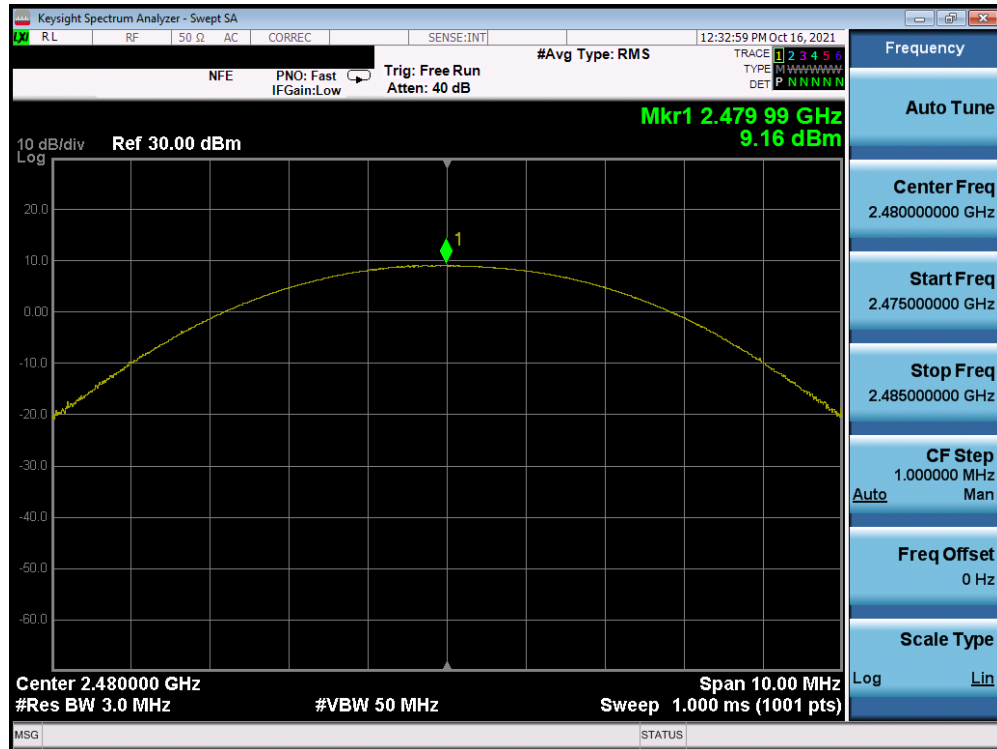


Plot 7-67. Peak Power Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 0) Antenna 2

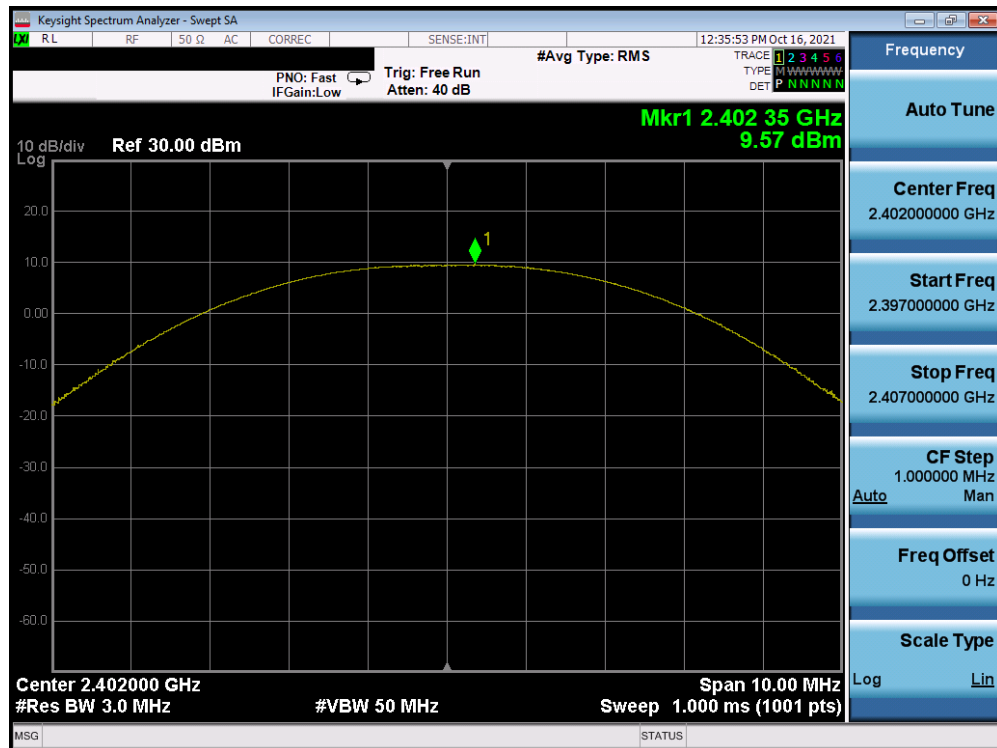


Plot 7-68. Peak Power Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 19) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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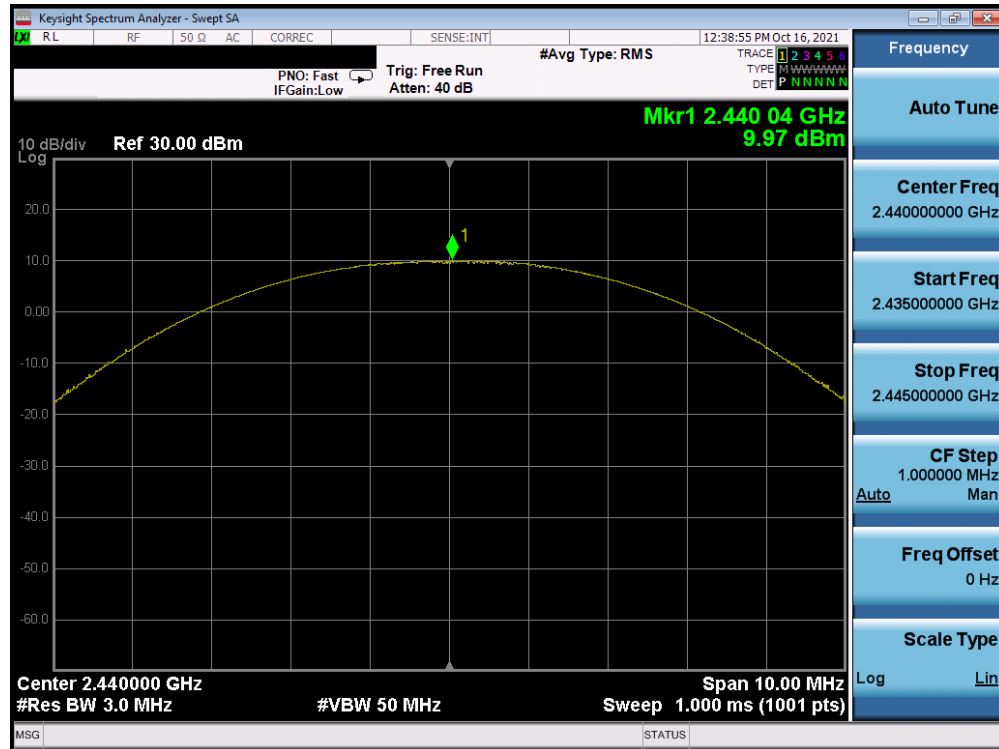


Plot 7-69. Peak Power Plot (Dual Bluetooth (LE), 1Mbps, iPA – Ch. 39) Antenna 2

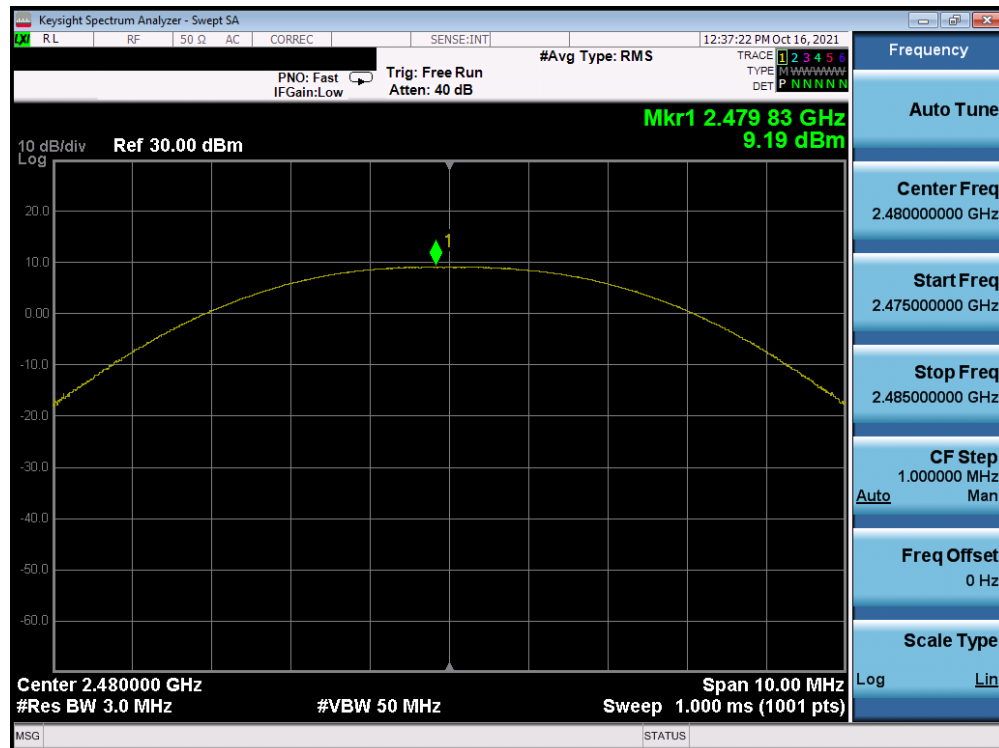


Plot 7-70. Peak Power Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 0) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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Plot 7-71. Peak Power Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 19) Antenna 2



Plot 7-72. Peak Power Plot (Dual Bluetooth (LE), 2Mbps, iPA – Ch. 39) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 54 of 128

7.4 Power Spectral Density – Bluetooth (LE)

§15.247(e); RSS-247 [5.2]

Test Overview and Limit

The peak power density is measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power and at the appropriate frequencies.

The maximum permissible power spectral density is 8 dBm in any 3 kHz band.

Test Procedure Used

ANSI C63.10-2013 – Section 11.10.2 Method PKPSD

KDB 558074 D01 v05r02 – Section 8.4 DTS Maximum Power Spectral Density level in the fundamental emission

Test Settings

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 1MHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-3. Test Instrument & Measurement Setup

Test Notes

None

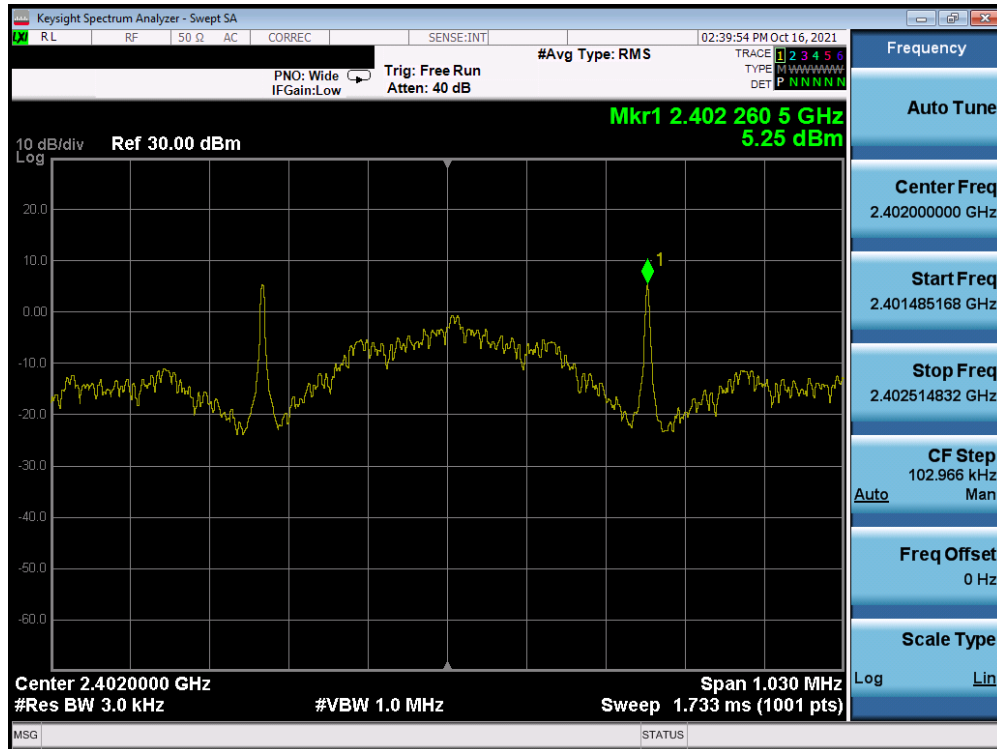
FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Antenna 1

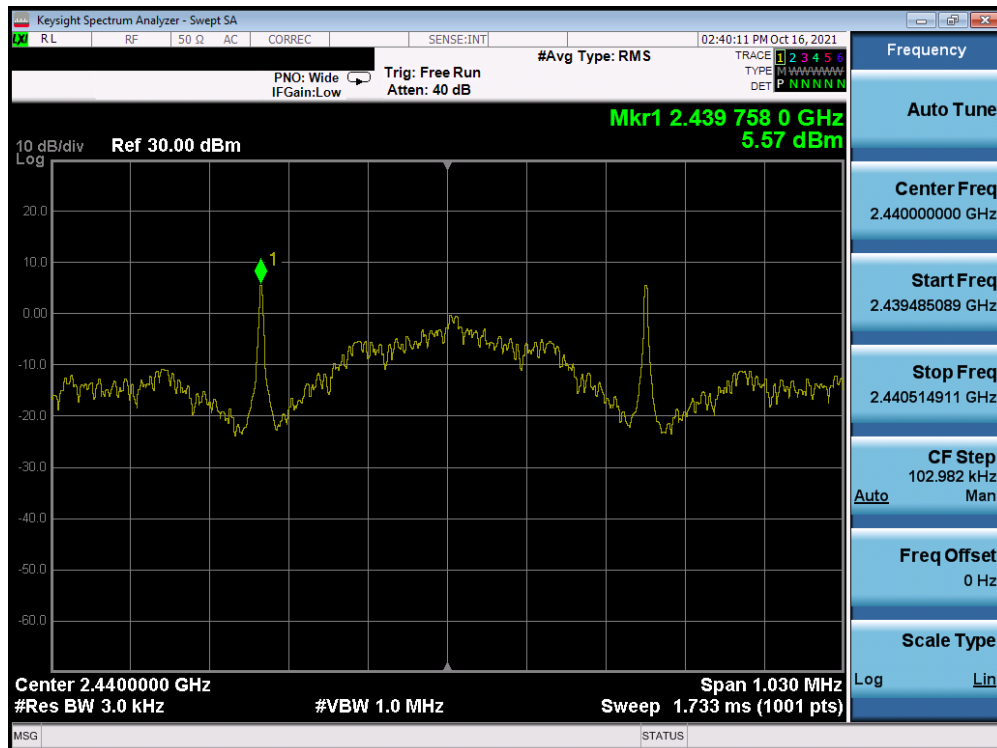
Frequency [MHz]	Data Rate	Power Scheme	Channel No.	Bluetooth Mode	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2402	125 kbps	iPA	0	LE	5.25	8.0	-2.75
2440	125 kbps	iPA	19	LE	5.57	8.0	-2.43
2480	125 kbps	iPA	39	LE	4.54	8.0	-3.46
2402	500 kbps	iPA	0	LE	5.16	8.0	-2.84
2440	500 kbps	iPA	19	LE	5.38	8.0	-2.62
2480	500 kbps	iPA	39	LE	4.36	8.0	-3.64
2402	1 Mbps	ePA	0	LE	1.71	8.0	-6.29
2440	1 Mbps	ePA	19	LE	2.44	8.0	-5.56
2480	1 Mbps	ePA	39	LE	1.32	8.0	-6.68
2402	1 Mbps	iPA	0	LE	-4.04	8.0	-14.12
2440	1 Mbps	iPA	19	LE	-3.66	8.0	-13.86
2480	1 Mbps	iPA	39	LE	-4.89	8.0	-14.94
2402	2 Mbps	ePA	0	LE	-0.10	8.0	-8.10
2440	2 Mbps	ePA	19	LE	0.36	8.0	-7.64
2480	2 Mbps	ePA	39	LE	-0.59	8.0	-8.59
2402	2 Mbps	iPA	0	LE	-6.12	8.0	-14.12
2440	2 Mbps	iPA	19	LE	-5.86	8.0	-13.86
2480	2 Mbps	iPA	39	LE	-6.94	8.0	-14.94

Table 7-7. Conducted Power Density Measurements Antenna 1

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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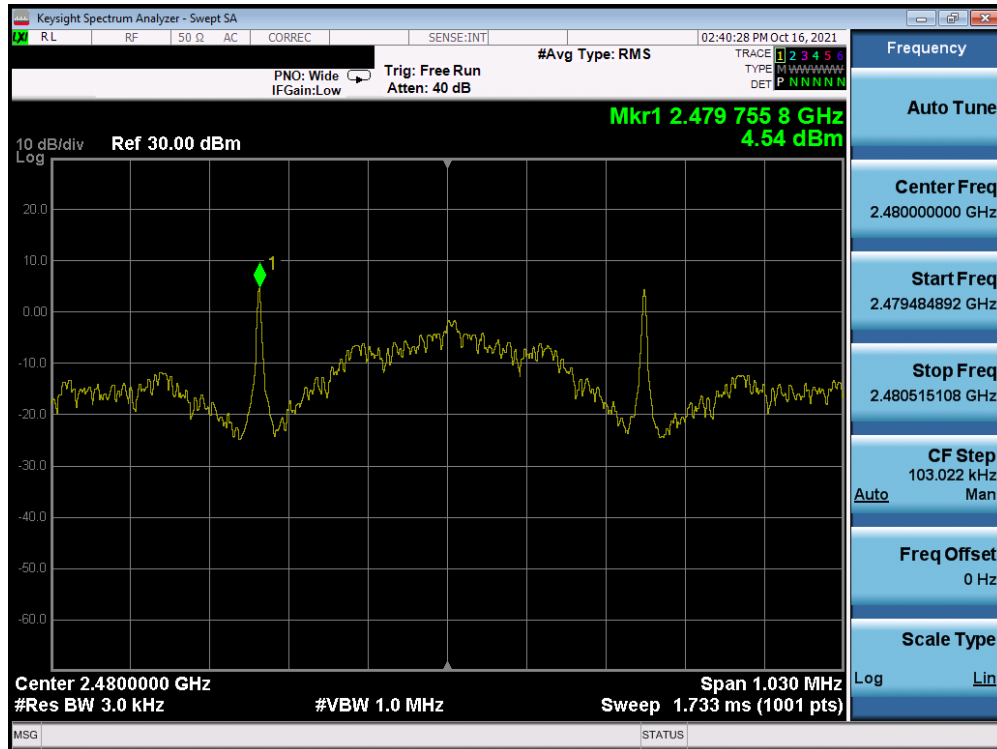


Plot 7-73. Power Spectral Density Plot (Bluetooth (LE), 125kbps, iPA – Ch. 0) Antenna 1

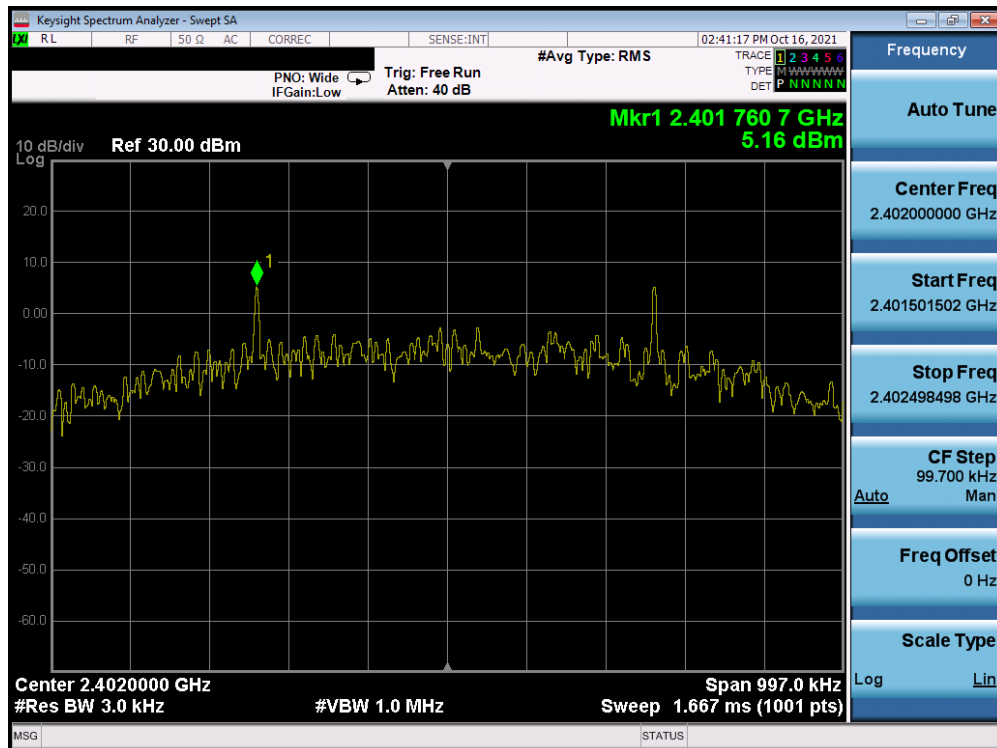


Plot 7-74. Power Spectral Density Plot (Bluetooth (LE), 125kbps, iPA – Ch. 19) Antenna 1

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 57 of 128

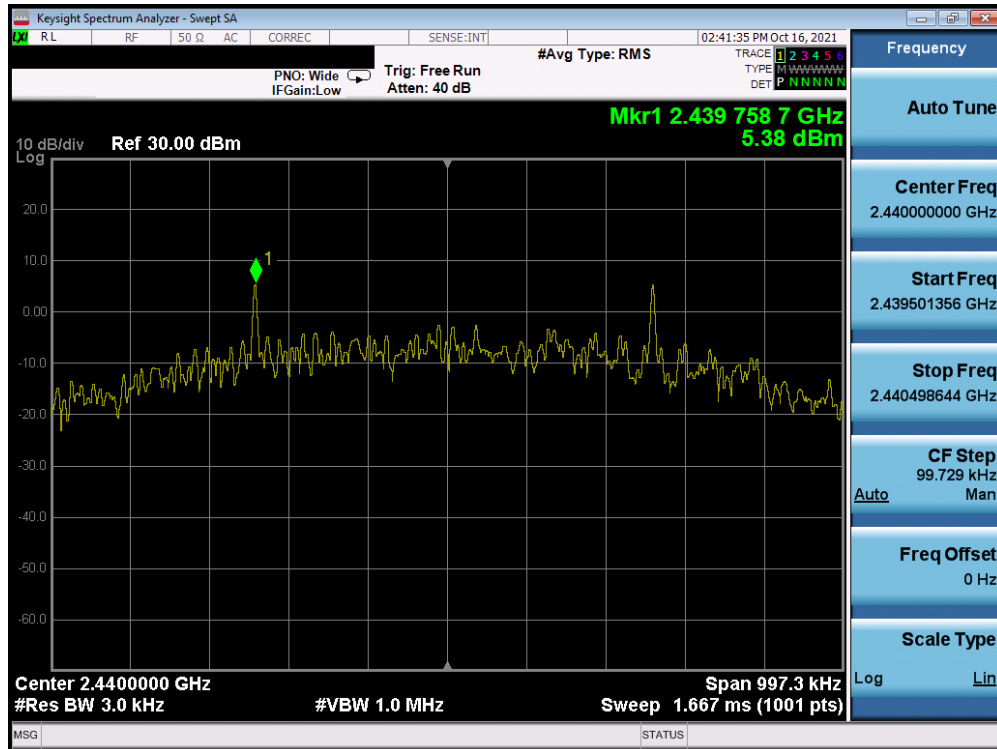


Plot 7-75. Power Spectral Density Plot (Bluetooth (LE), 125kbps, iPA – Ch. 39) Antenna 1

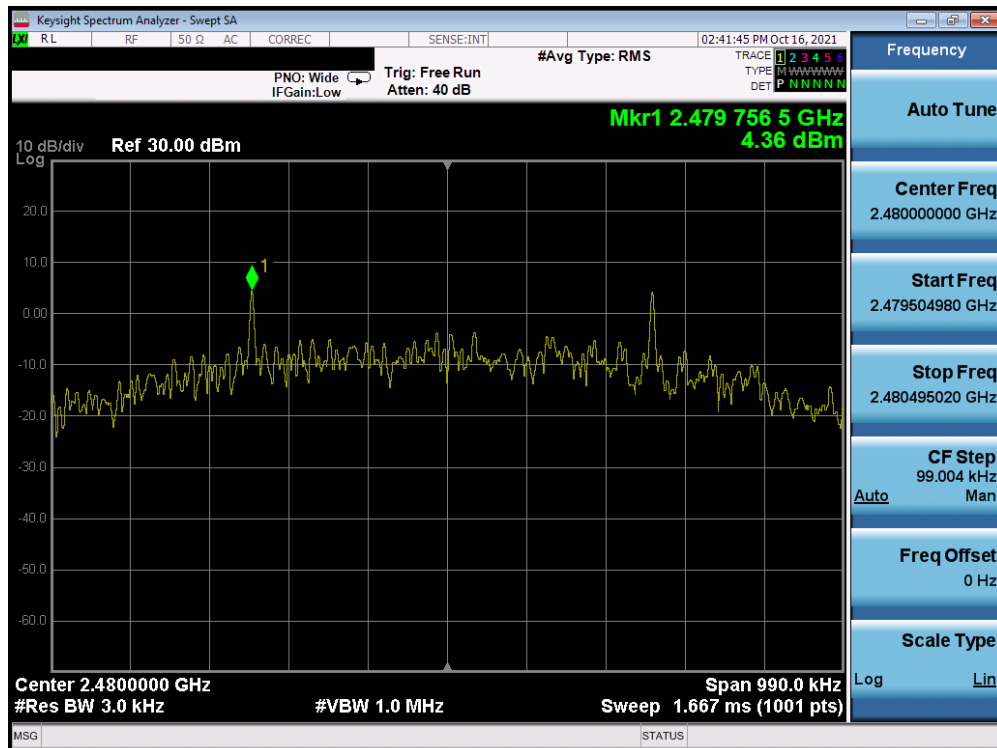


Plot 7-76. Power Spectral Density Plot (Bluetooth (LE), 500kbps, iPA – Ch. 0) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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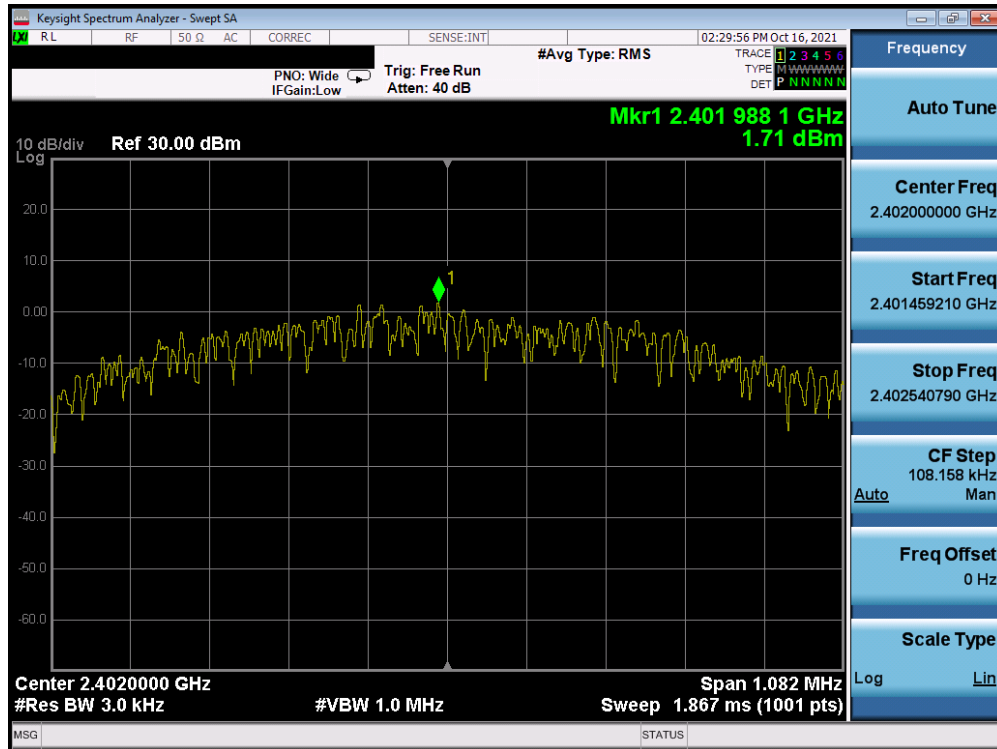


Plot 7-77. Power Spectral Density Plot (Bluetooth (LE), 500kbps, iPA – Ch. 19) Antenna 1

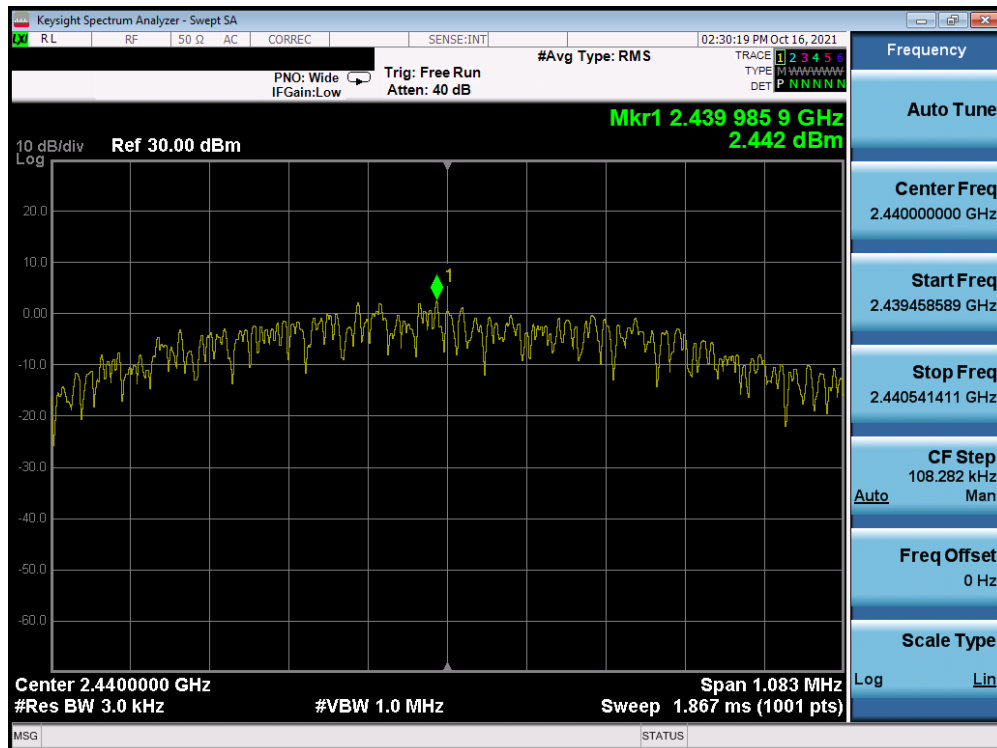


Plot 7-78. Power Spectral Density Plot (Bluetooth (LE), 500kbps, iPA – Ch. 39) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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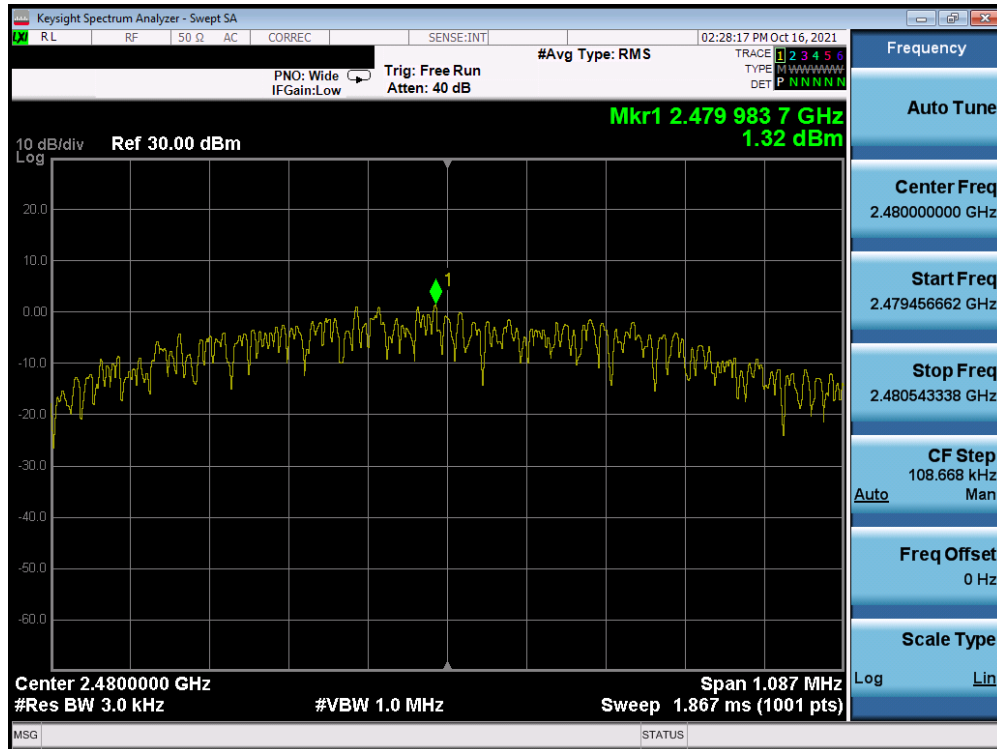


Plot 7-79. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 0) Antenna 1

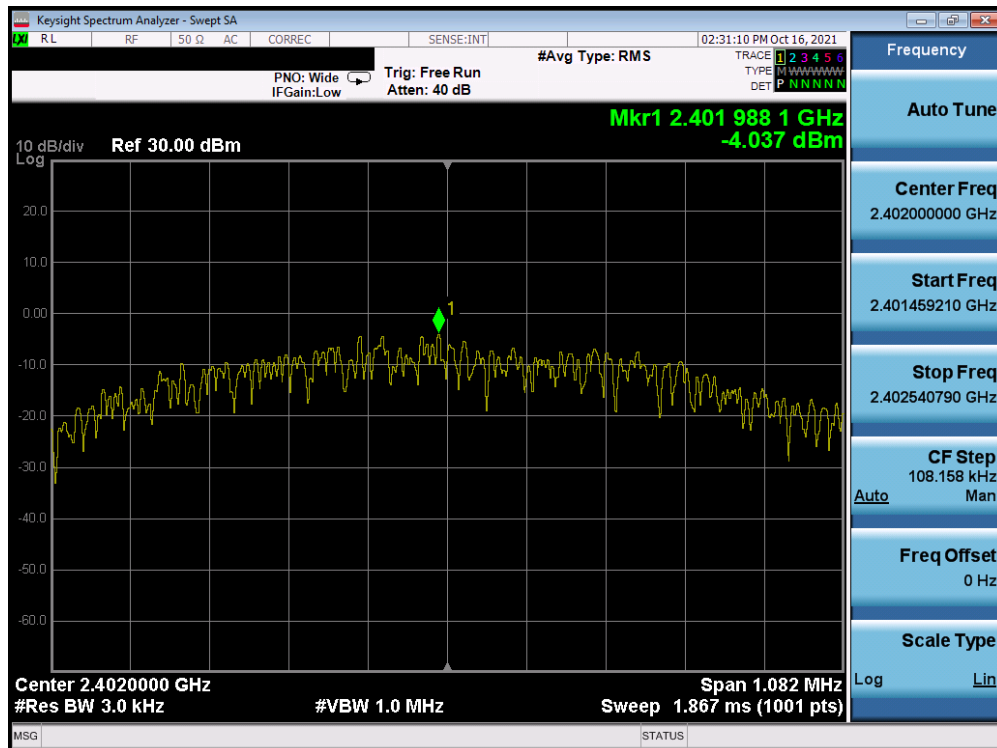


Plot 7-80. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 19) Antenna 1

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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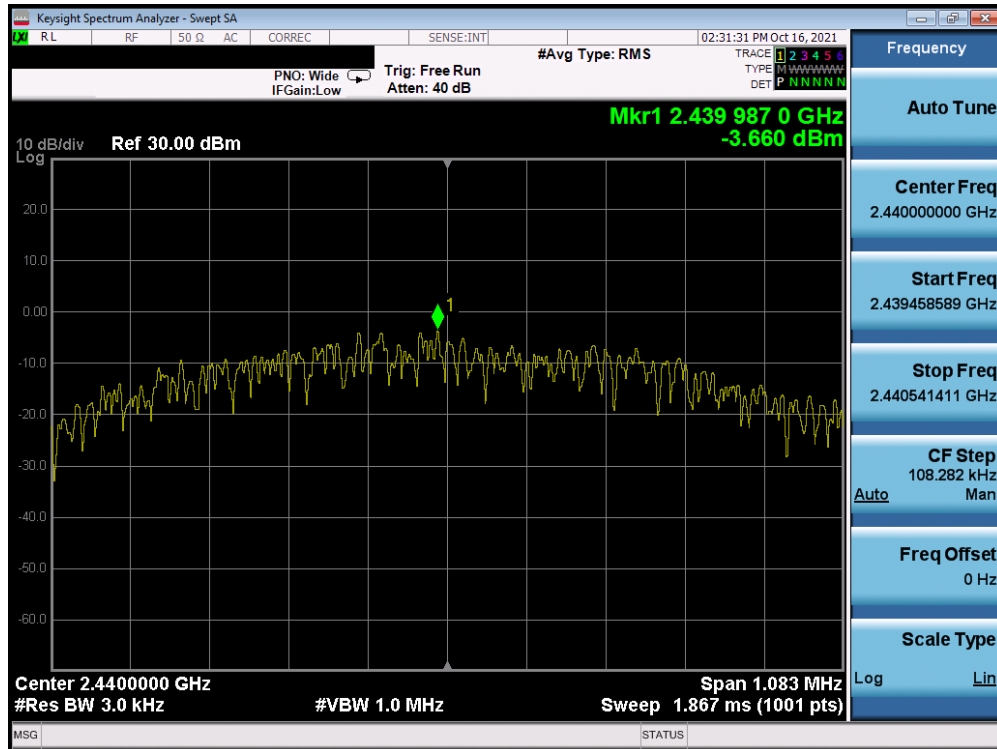


Plot 7-81. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 39) Antenna 1

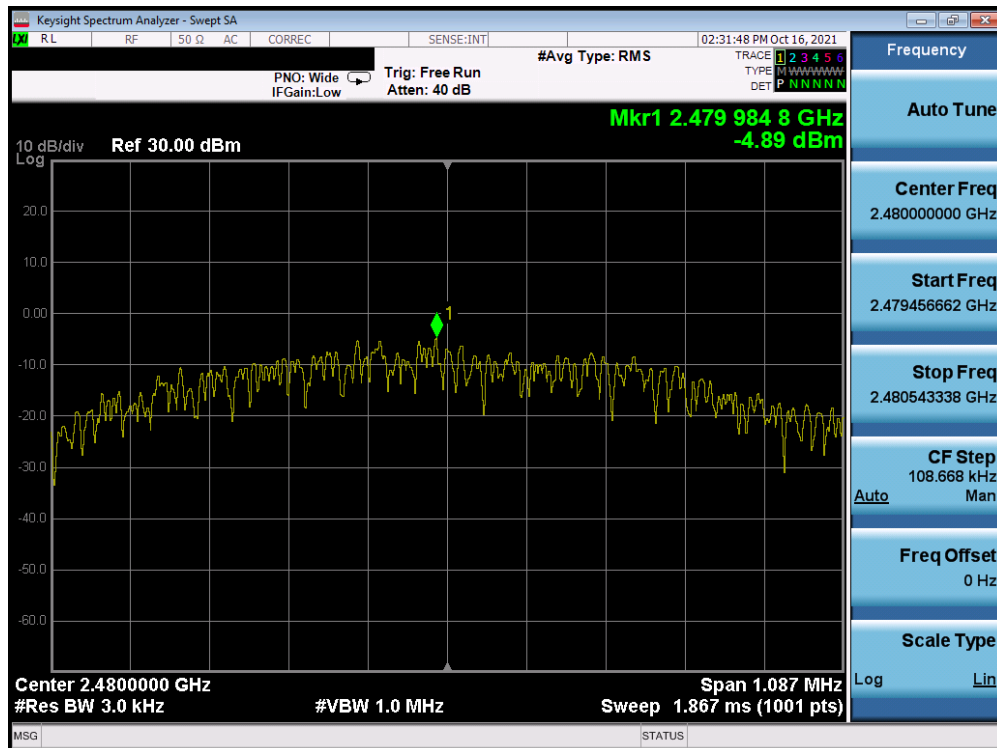


Plot 7-82. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, iPA – Ch. 0) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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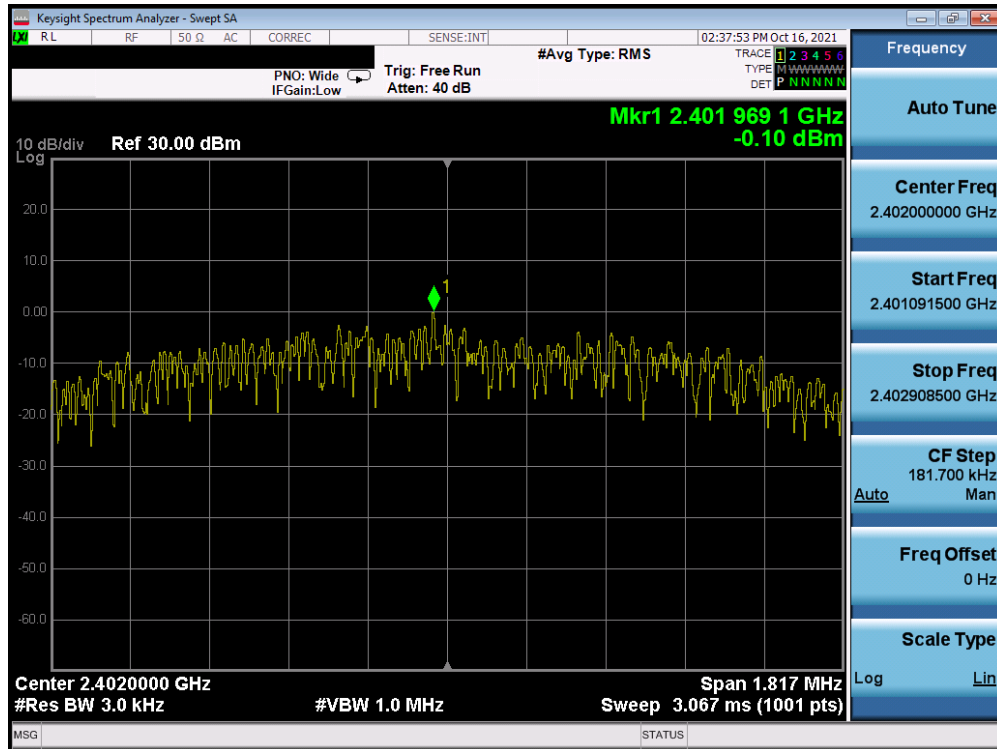


Plot 7-83. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, iPA – Ch. 19) Antenna 1

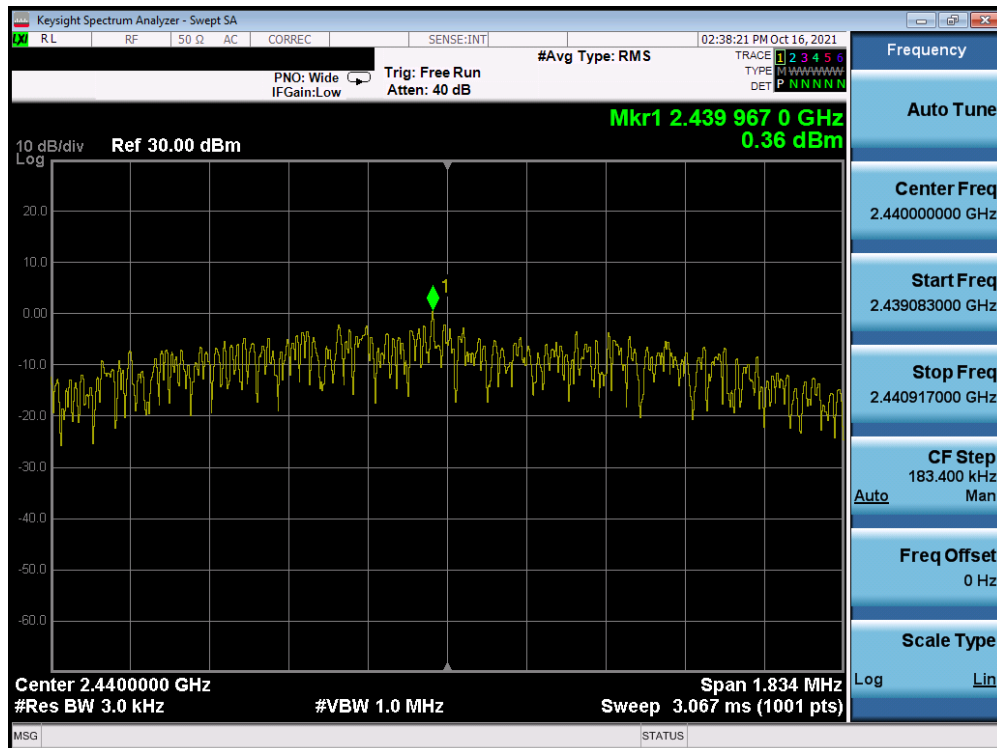


Plot 7-84. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, iPA – Ch. 39) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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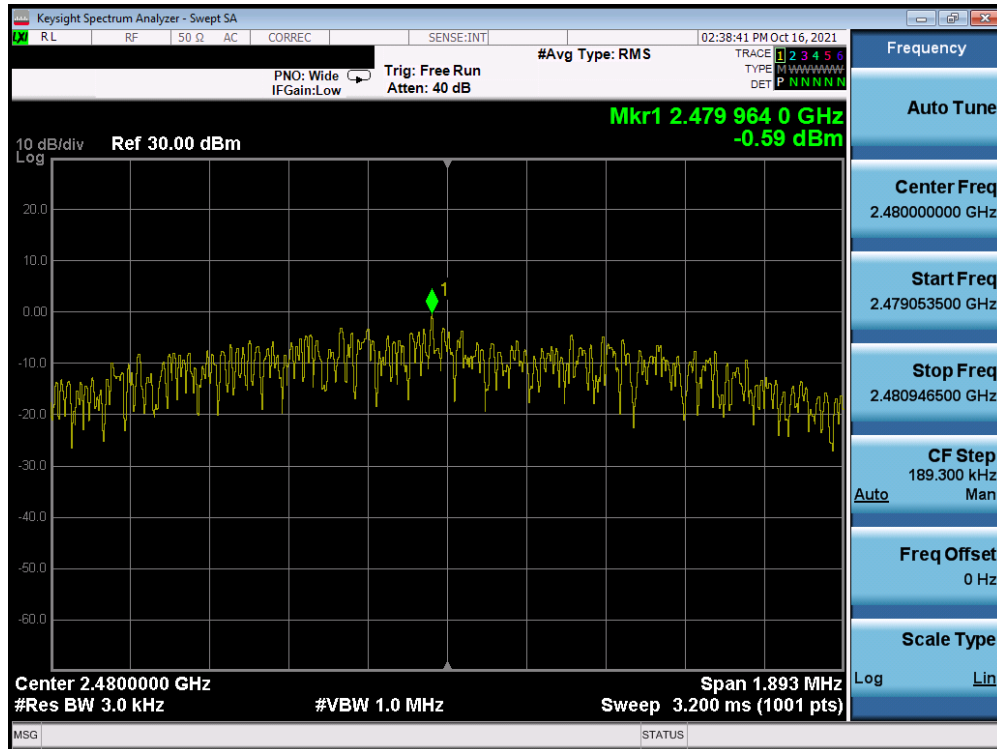


Plot 7-85. Power Spectral Density Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 0) Antenna 1

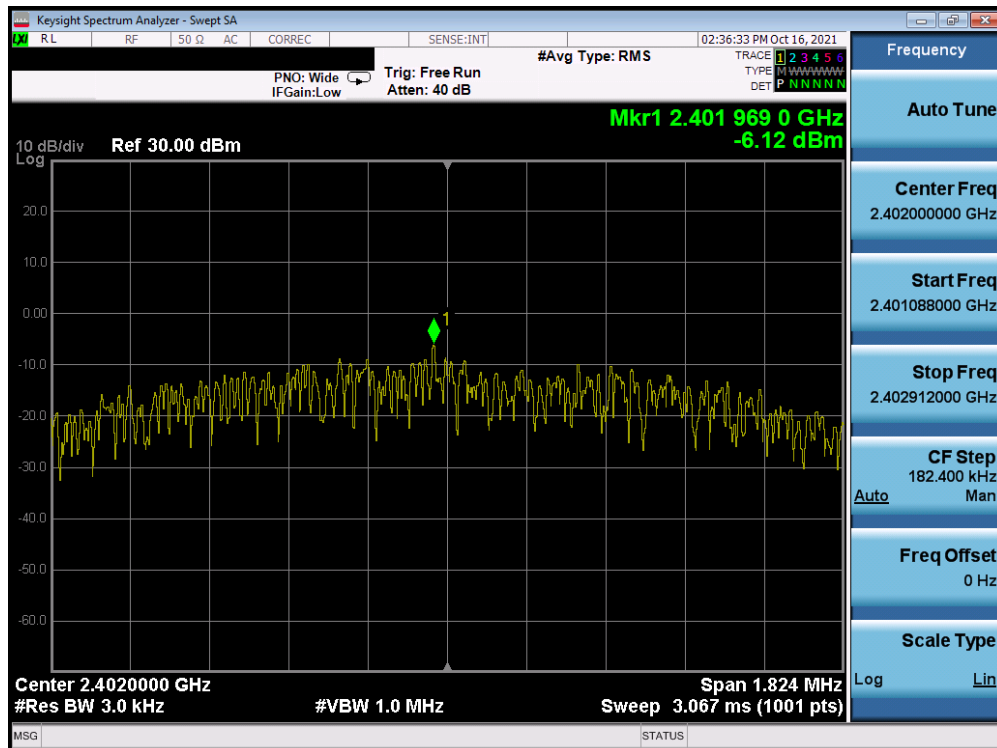


Plot 7-86. Power Spectral Density Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 19) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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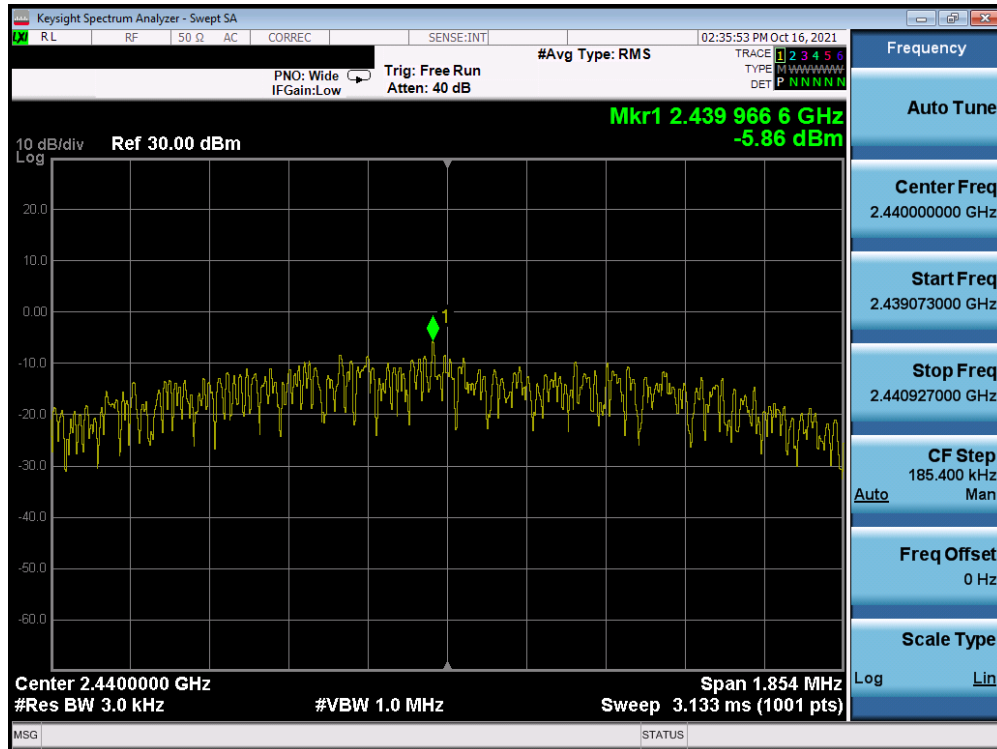


Plot 7-87. Power Spectral Density Plot (Bluetooth (LE), 2Mbps, ePA – Ch. 39) Antenna 1

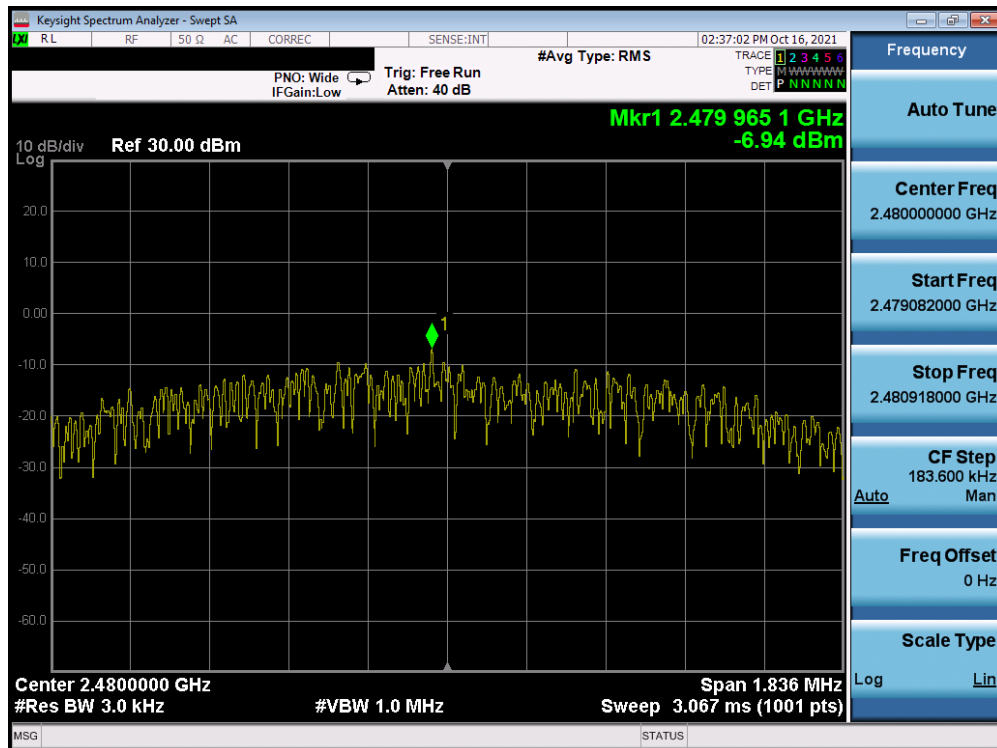


Plot 7-88. Power Spectral Density Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 0) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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Plot 7-89. Power Spectral Density Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 19) Antenna 1



Plot 7-90. Power Spectral Density Plot (Bluetooth (LE), 2Mbps, iPA – Ch. 39) Antenna 1

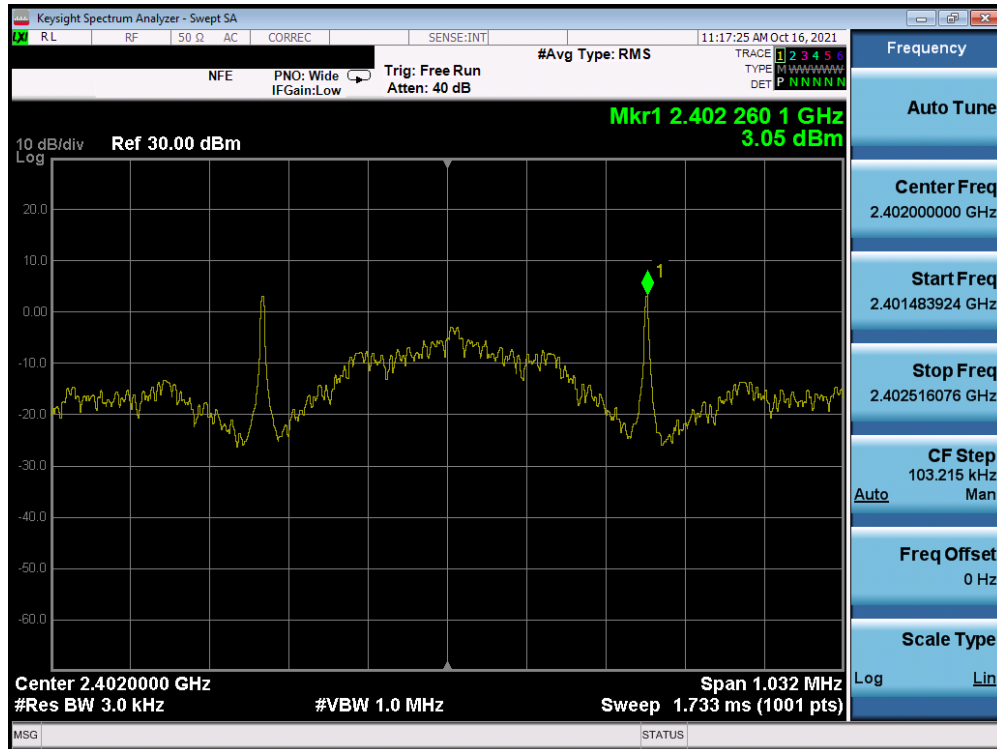
FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 65 of 128

Antenna 2

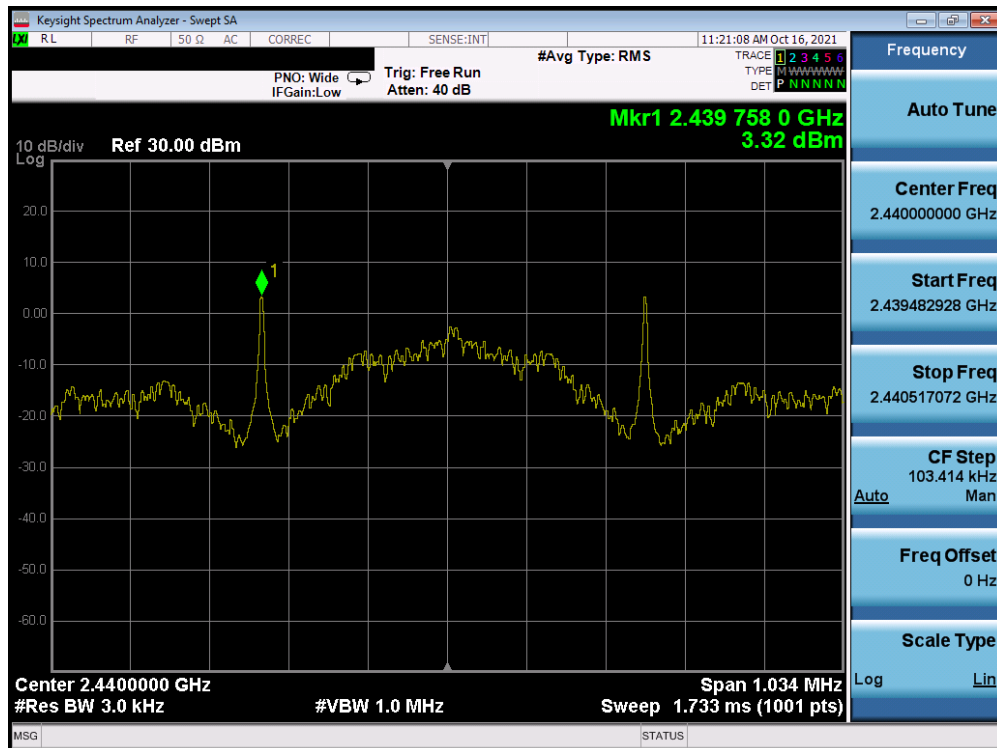
Frequency [MHz]	Data Rate [Mbps]	Power Scheme	Channel No.	Bluetooth Mode	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]
2402	125 kbps	iPA	0	LE	3.05	8.0	-4.95
2440	125 kbps	iPA	19	LE	3.32	8.0	-4.68
2480	125 kbps	iPA	39	LE	2.52	8.0	-5.48
2402	500 kbps	iPA	0	LE	3.04	8.0	-4.96
2440	500 kbps	iPA	19	LE	3.04	8.0	-4.96
2480	500 kbps	iPA	39	LE	2.34	8.0	-5.66
2402	1 Mbps	ePA	0	LE	-0.44	8.0	-8.44
2440	1 Mbps	ePA	19	LE	-0.29	8.0	-8.29
2480	1 Mbps	ePA	39	LE	-0.70	8.0	-8.70
2402	1 Mbps	iPA	0	LE	-6.25	8.0	-14.25
2440	1 Mbps	iPA	19	LE	-6.25	8.0	-14.25
2480	1 Mbps	iPA	39	LE	-6.96	8.0	-14.96
2402	2 Mbps	ePA	0	LE	-2.01	8.0	-10.01
2440	2 Mbps	ePA	19	LE	-2.21	8.0	-10.21
2480	2 Mbps	ePA	39	LE	-2.60	8.0	-10.60
2402	2 Mbps	iPA	0	LE	-8.54	8.0	-16.54
2440	2 Mbps	iPA	19	LE	-8.22	8.0	-16.22
2480	2 Mbps	iPA	39	LE	-8.86	8.0	-16.86

Table 7-8. Conducted Power Density Measurements Antenna 2

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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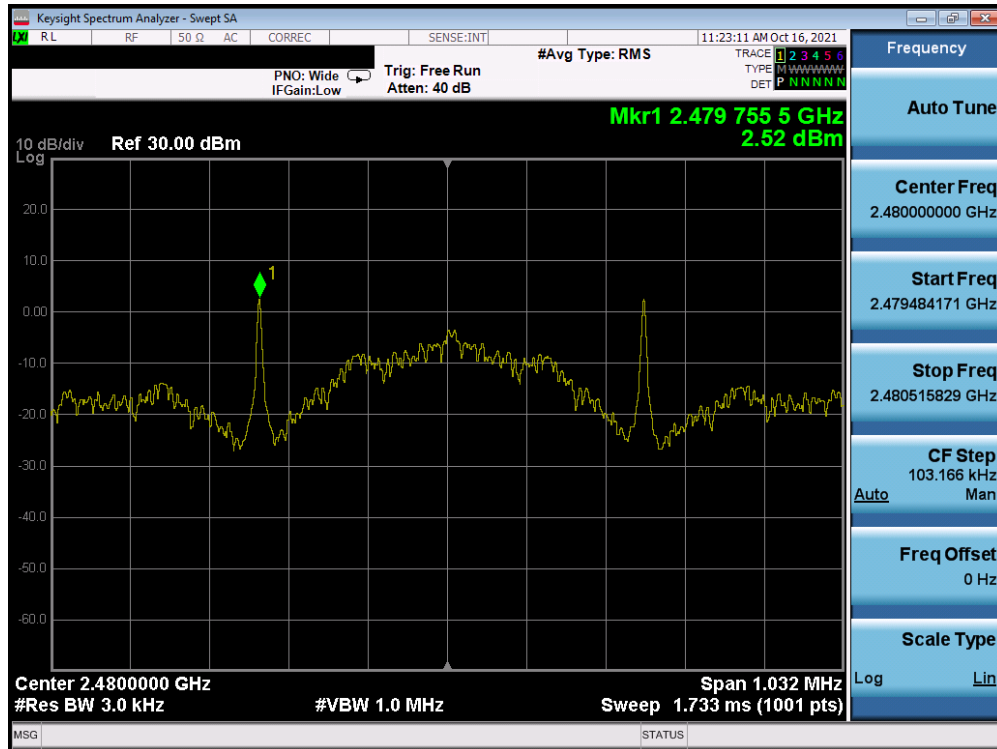


Plot 7-91. Power Spectral Density Plot (Bluetooth (LE), 125kbps, iPA – Ch. 0) Antenna 2

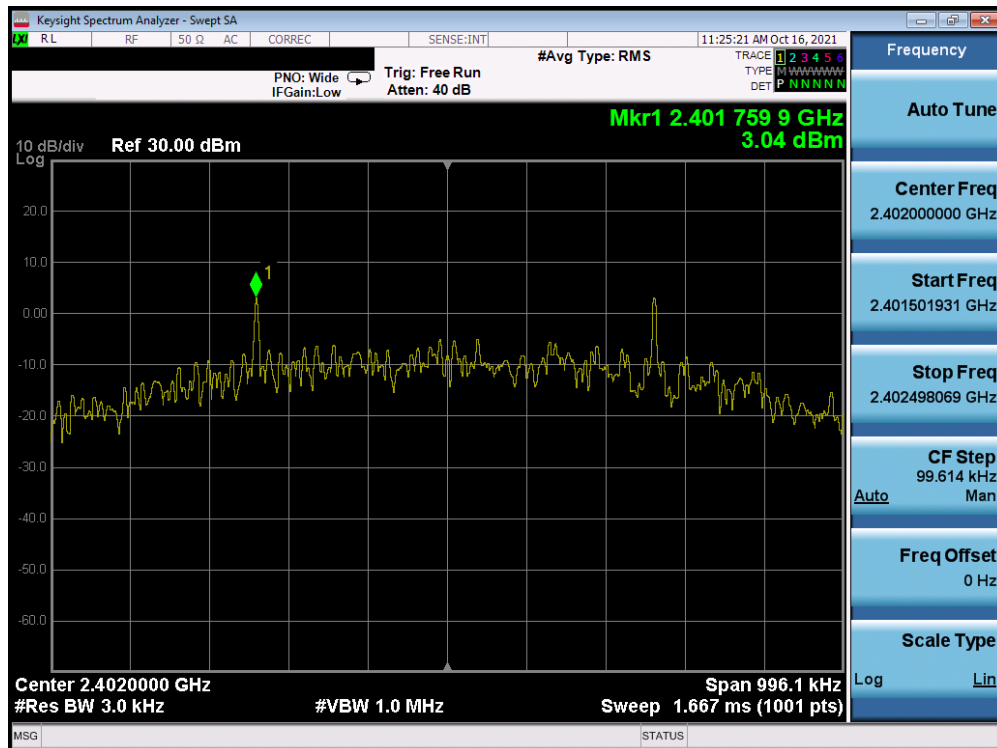


Plot 7-92. Power Spectral Density Plot (Bluetooth (LE), 125kbps, iPA – Ch. 19) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 67 of 128

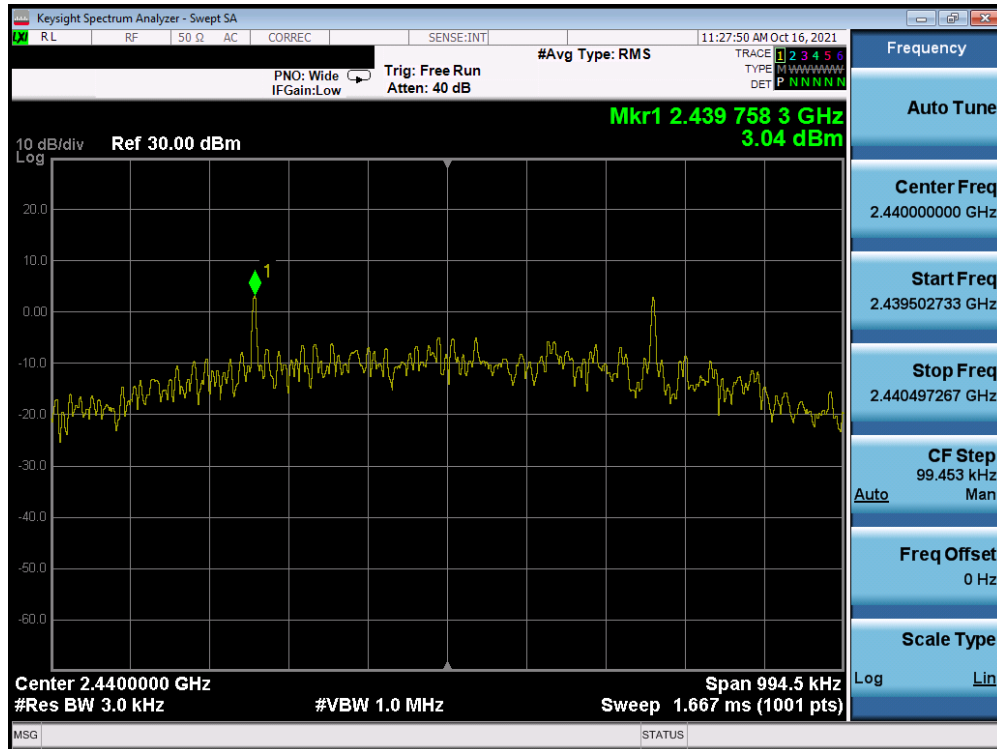


Plot 7-93. Power Spectral Density Plot (Bluetooth (LE), 125kbps, iPA – Ch. 39) Antenna 2

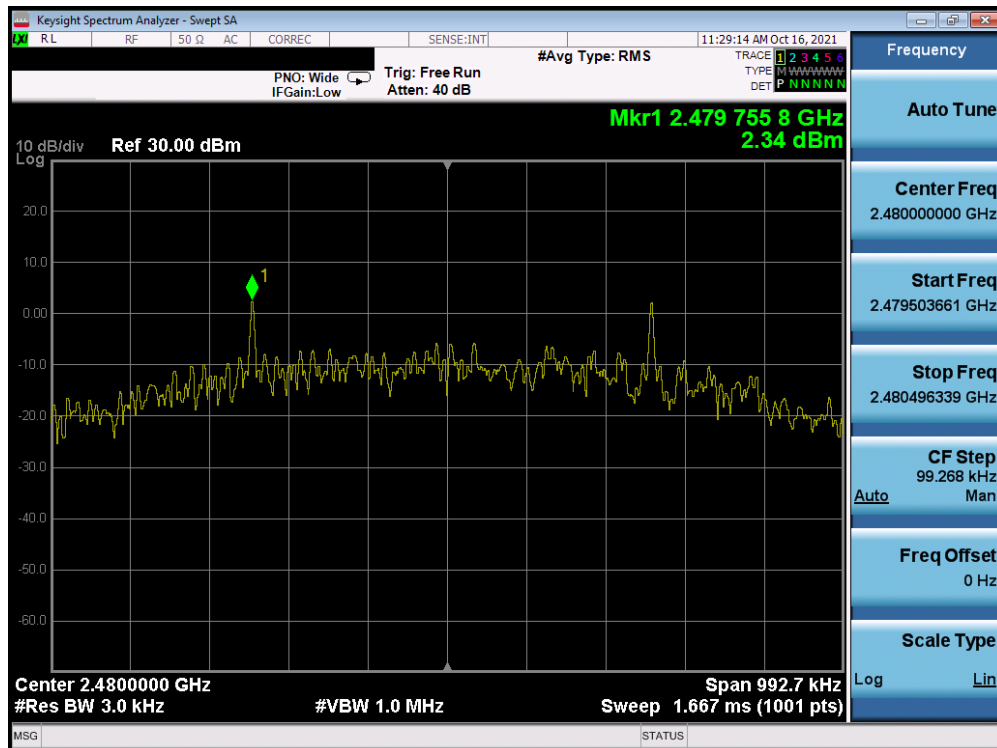


Plot 7-94. Power Spectral Density Plot (Bluetooth (LE), 500kbps, iPA – Ch. 0) Antenna 2

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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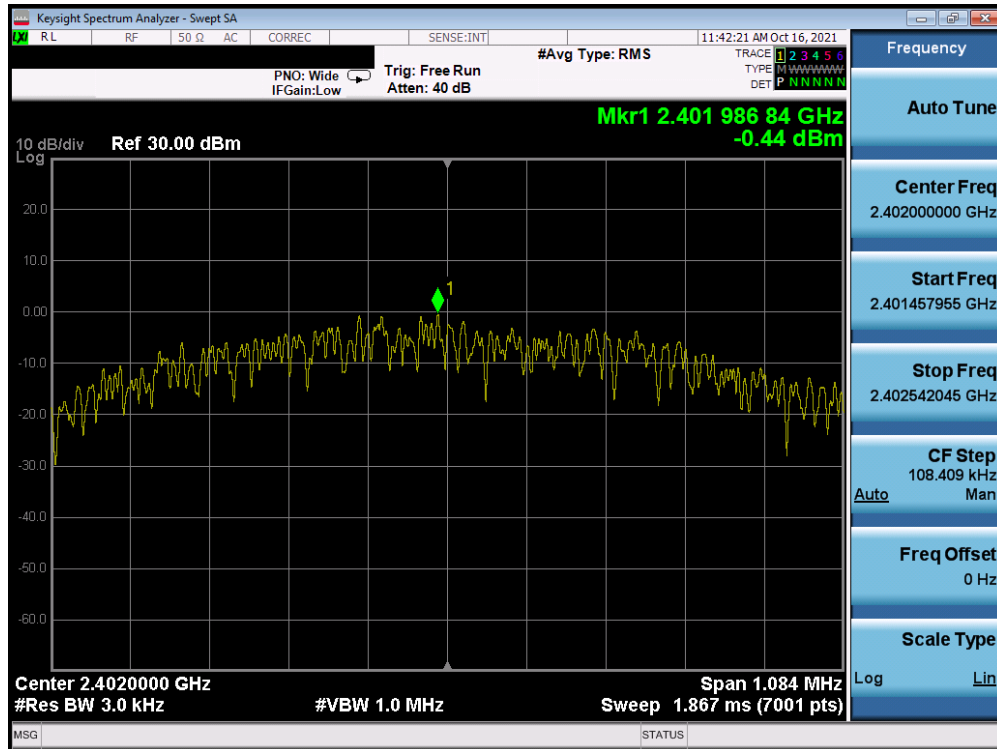


Plot 7-95. Power Spectral Density Plot (Bluetooth (LE), 500kbps, iPA – Ch. 19) Antenna 2

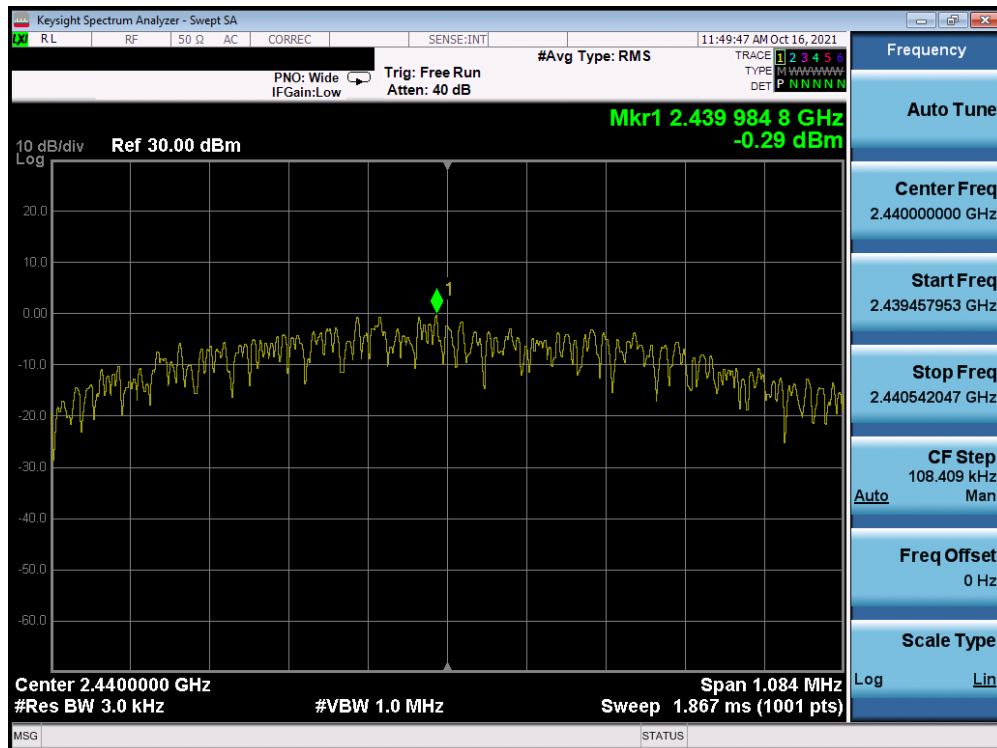


Plot 7-96. Power Spectral Density Plot (Bluetooth (LE), 500kbps, iPA – Ch. 39) Antenna 1

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 69 of 128

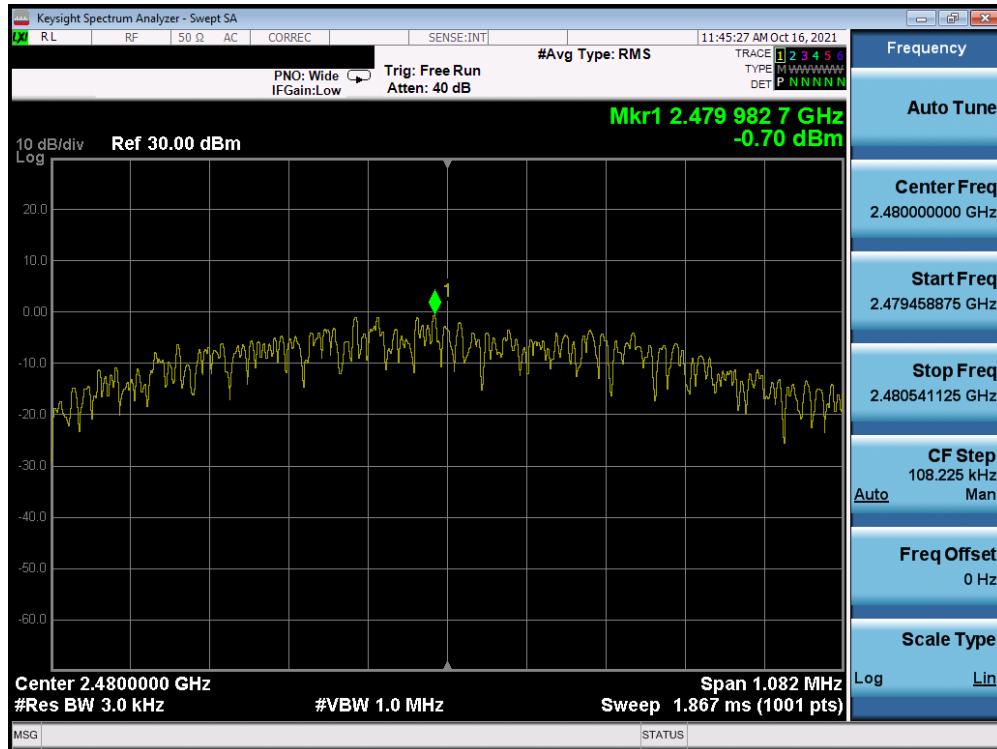


Plot 7-97. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 0) Antenna 2

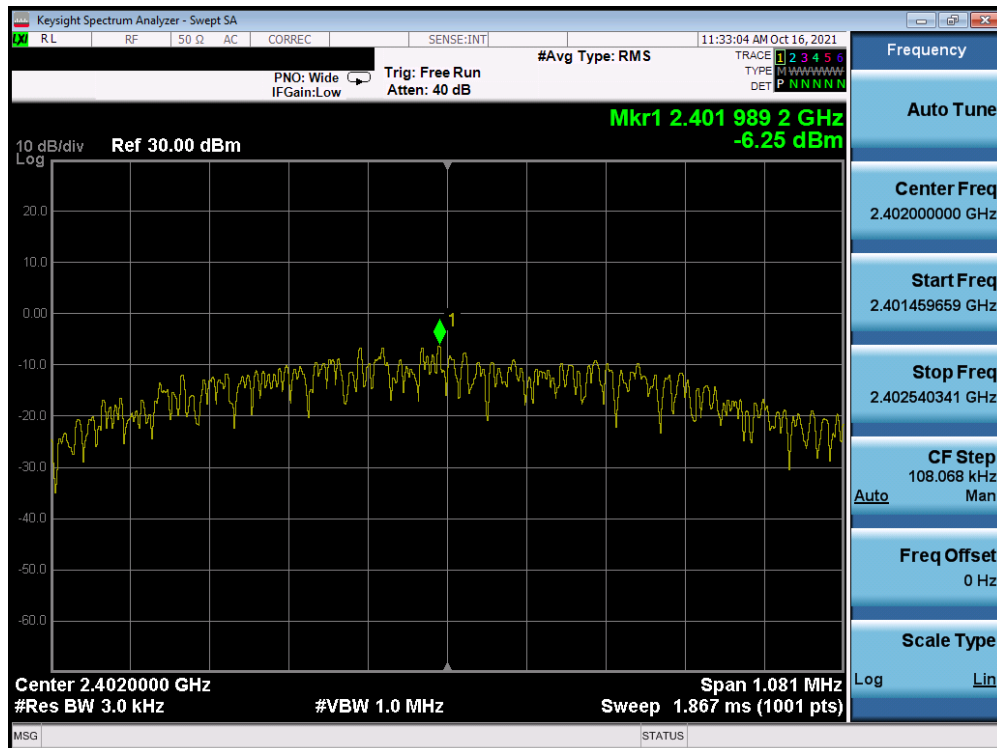


Plot 7-98. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 19) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-17.A3L	Test Dates: 10/8/2021-10/25/2021	EUT Type: Portable Handset		Page 70 of 128

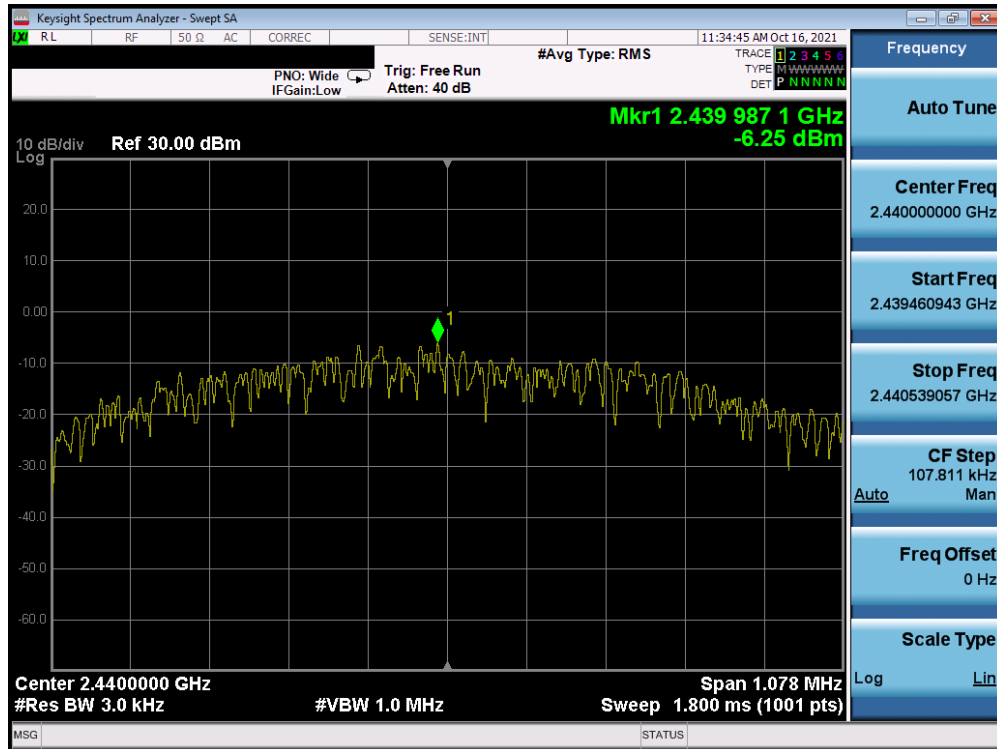


Plot 7-99. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, ePA – Ch. 39) Antenna 2

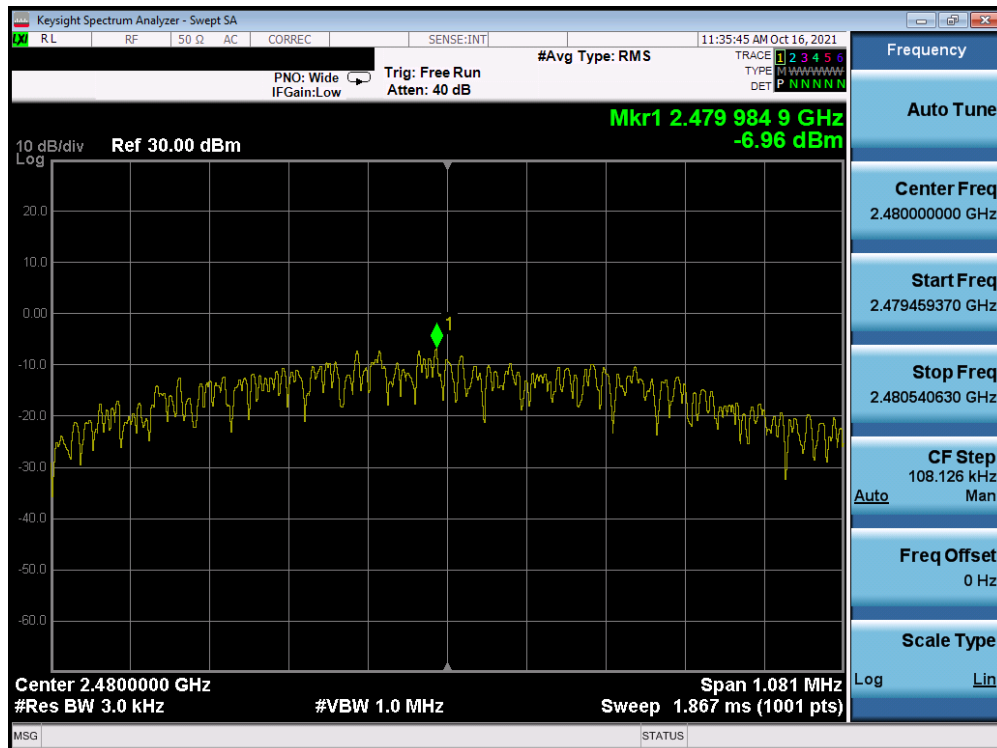


Plot 7-100. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, iPA – Ch. 0) Antenna 2

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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Plot 7-101. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, iPA – Ch. 19) Antenna 2



Plot 7-102. Power Spectral Density Plot (Bluetooth (LE), 1Mbps, iPA – Ch. 39) Antenna 2

FCC ID: A3LSMS908U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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